

## **Regional Information Report 4K08-11**

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# **Project Operational Plan for the 2008 Pribilof District King Crab Survey**

by

**Robert K. Gish**

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August 2008

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Alaska Department of Fish and Game

Division of Commercial Fisheries



## Symbols and Abbreviations

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| Weights and measures (metric)         |                    | General                  |                                  | Measures (fisheries)             |                         |
|---------------------------------------|--------------------|--------------------------|----------------------------------|----------------------------------|-------------------------|
| centimeter                            | cm                 | Alaska Administrative    |                                  | fork length                      | FL                      |
| deciliter                             | dL                 | Code                     | AAC                              | mid-eye-to-fork                  | MEF                     |
| gram                                  | g                  | all commonly accepted    |                                  | mid-eye-to-tail-fork             | METF                    |
| hectare                               | ha                 | abbreviations            | e.g., Mr., Mrs.,<br>AM, PM, etc. | standard length                  | SL                      |
| kilogram                              | kg                 |                          |                                  | total length                     | TL                      |
| kilometer                             | km                 | all commonly accepted    |                                  |                                  |                         |
| liter                                 | L                  | professional titles      | e.g., Dr., Ph.D.,<br>R.N., etc.  | <b>Mathematics, statistics</b>   |                         |
| meter                                 | m                  |                          |                                  | <i>all standard mathematical</i> |                         |
| milliliter                            | mL                 | at                       | @                                | <i>signs, symbols and</i>        |                         |
| millimeter                            | mm                 | compass directions:      |                                  | <i>abbreviations</i>             |                         |
|                                       |                    | east                     | E                                | alternate hypothesis             | H <sub>A</sub>          |
|                                       |                    | north                    | N                                | base of natural logarithm        | <i>e</i>                |
|                                       |                    | south                    | S                                | catch per unit effort            | CPUE                    |
|                                       |                    | west                     | W                                | coefficient of variation         | CV                      |
|                                       |                    | copyright                | ©                                | common test statistics           | (F, t, $\chi^2$ , etc.) |
|                                       |                    | corporate suffixes:      |                                  | confidence interval              | CI                      |
|                                       |                    | Company                  | Co.                              | correlation coefficient          |                         |
|                                       |                    | Corporation              | Corp.                            | (multiple)                       | R                       |
|                                       |                    | Incorporated             | Inc.                             | correlation coefficient          |                         |
|                                       |                    | Limited                  | Ltd.                             | (simple)                         | r                       |
|                                       |                    | District of Columbia     | D.C.                             | covariance                       | cov                     |
|                                       |                    | et alii (and others)     | et al.                           | degree (angular)                 | °                       |
|                                       |                    | et cetera (and so forth) | etc.                             | degrees of freedom               | df                      |
|                                       |                    | exempli gratia           |                                  | expected value                   | <i>E</i>                |
|                                       |                    | (for example)            | e.g.                             | greater than                     | >                       |
|                                       |                    | Federal Information      |                                  | greater than or equal to         | ≥                       |
|                                       |                    | Code                     | FIC                              | harvest per unit effort          | HPUE                    |
|                                       |                    | id est (that is)         | i.e.                             | less than                        | <                       |
|                                       |                    | latitude or longitude    | lat. or long.                    | less than or equal to            | ≤                       |
|                                       |                    | monetary symbols         |                                  | logarithm (natural)              | ln                      |
|                                       |                    | (U.S.)                   | \$, ¢                            | logarithm (base 10)              | log                     |
|                                       |                    | months (tables and       |                                  | logarithm (specify base)         | log <sub>2</sub> , etc. |
|                                       |                    | figures): first three    |                                  | minute (angular)                 | '                       |
|                                       |                    | letters                  | Jan,...,Dec                      | not significant                  | NS                      |
|                                       |                    | registered trademark     | ®                                | null hypothesis                  | H <sub>0</sub>          |
|                                       |                    | trademark                | ™                                | percent                          | %                       |
|                                       |                    | United States            |                                  | probability                      | P                       |
|                                       |                    | (adjective)              | U.S.                             | probability of a type I error    |                         |
|                                       |                    | United States of         |                                  | (rejection of the null           |                         |
|                                       |                    | America (noun)           | USA                              | hypothesis when true)            | $\alpha$                |
|                                       |                    | U.S.C.                   | United States                    | probability of a type II error   |                         |
|                                       |                    |                          | Code                             | (acceptance of the null          |                         |
|                                       |                    | U.S. state               | use two-letter                   | hypothesis when false)           | $\beta$                 |
|                                       |                    |                          | abbreviations                    | second (angular)                 | "                       |
|                                       |                    |                          | (e.g., AK, WA)                   | standard deviation               | SD                      |
|                                       |                    |                          |                                  | standard error                   | SE                      |
|                                       |                    |                          |                                  | variance                         |                         |
|                                       |                    |                          |                                  | population                       | Var                     |
|                                       |                    |                          |                                  | sample                           | var                     |
| <b>Weights and measures (English)</b> |                    |                          |                                  |                                  |                         |
| cubic feet per second                 | ft <sup>3</sup> /s |                          |                                  |                                  |                         |
| foot                                  | ft                 |                          |                                  |                                  |                         |
| gallon                                | gal                |                          |                                  |                                  |                         |
| inch                                  | in                 |                          |                                  |                                  |                         |
| mile                                  | mi                 |                          |                                  |                                  |                         |
| nautical mile                         | nmi                |                          |                                  |                                  |                         |
| ounce                                 | oz                 |                          |                                  |                                  |                         |
| pound                                 | lb                 |                          |                                  |                                  |                         |
| quart                                 | qt                 |                          |                                  |                                  |                         |
| yard                                  | yd                 |                          |                                  |                                  |                         |
| <b>Time and temperature</b>           |                    |                          |                                  |                                  |                         |
| day                                   | d                  |                          |                                  |                                  |                         |
| degrees Celsius                       | °C                 |                          |                                  |                                  |                         |
| degrees Fahrenheit                    | °F                 |                          |                                  |                                  |                         |
| degrees kelvin                        | K                  |                          |                                  |                                  |                         |
| hour                                  | h                  |                          |                                  |                                  |                         |
| minute                                | min                |                          |                                  |                                  |                         |
| second                                | s                  |                          |                                  |                                  |                         |
| <b>Physics and chemistry</b>          |                    |                          |                                  |                                  |                         |
| all atomic symbols                    |                    |                          |                                  |                                  |                         |
| alternating current                   | AC                 |                          |                                  |                                  |                         |
| ampere                                | A                  |                          |                                  |                                  |                         |
| calorie                               | cal                |                          |                                  |                                  |                         |
| direct current                        | DC                 |                          |                                  |                                  |                         |
| hertz                                 | Hz                 |                          |                                  |                                  |                         |
| horsepower                            | hp                 |                          |                                  |                                  |                         |
| hydrogen ion activity                 | pH                 |                          |                                  |                                  |                         |
| (negative log of)                     |                    |                          |                                  |                                  |                         |
| parts per million                     | ppm                |                          |                                  |                                  |                         |
| parts per thousand                    | ppt,<br>‰          |                          |                                  |                                  |                         |
| volts                                 | V                  |                          |                                  |                                  |                         |
| watts                                 | W                  |                          |                                  |                                  |                         |

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**PROJECT OPERATIONAL PLAN FOR THE 2008 PRIBILOF  
DISTRICT KING CRAB SURVEY**

by

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August 2008

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## ABSTRACT

This report describes the operational plan for the 2008 Pribilof District king crab survey on the distribution and relative abundance of red king crabs *Paralithodes camtschaticus* and blue king crabs *P. platypus* around the Pribilof Islands just prior to the fall fishing season. Descriptions of the objectives, study area, survey design, sampling methods, data analysis, and reporting are given. The Alaska Department of Fish and Game (ADF&G) will conduct the survey aboard the chartered F/V Scandies Rose (a 39.6-m commercial crab-pot fishing vessel) in the Pribilof District of the Bering Sea king crab registration area (Area Q). Two-hundred-forty stations northeast of and surrounding St. Paul and St. George Islands will be sampled during the 32-day survey. Additionally, pots will be fished in a manner similar to that used during commercial fishing in areas of current concentrations and in historic catch locations. Bottom water temperature and salinity data will be collected across the depth range of fished pots. Benthic habitat data will be collected continuously for the duration of the survey.

**Keywords:** Red king crab, *Paralithodes camtschaticus*, blue king crab, *P. platypus*, Bering Sea, Pribilof Islands, pot survey, relative abundance, distribution, bottom temperature, salinity, benthic habitat.

## INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) first opened the Pribilof District red king crab *Paralithodes camtschaticus* fishery in 1993 and the fishery was prosecuted annually through the 1998 season, resulting in a total harvest of 6.3-million pounds worth \$28.6 million (Bowers et al. 2008). The fishery has been closed since 1999, although the stock has been estimated to be above minimum stock size threshold (MSST) established in the Fishery Management Plan for Bering Sea/Aleutian Islands king and Tanner crab (NPFMC *in prep*).

Historically, the Pribilof District king crab fishery was directed on blue king crabs *P. platypus*. Annual landings of blue king crab fluctuated widely and the fishery was closed from the 1988/89 season through 1994. The Pribilof District king crab fishery opened as a directed red king crab fishery in 1993 and 1994 and the fishery was opened concurrently for both red and blue king crabs during the fall 1995 through 1998 seasons. The Pribilof District has been closed to fishing for both red and blue king crabs since 1999 when the National Marine Fisheries Service (NMFS) survey results indicated the blue king crab stock was below the threshold for a fishery opening (Bowers et al. 2008). Survey results since 1999 showed continued declines of blue king crab through 2002, when the stock was estimated to be below MSST and declared “overfished” (NPFMC 2002). However, Pribilof District red king crab stock abundance estimates initially continued to be well above MSST and approaching or above maximum sustainable yield (MSY) biomass through 2003 (NPFMC 2004). The department estimated numbers of mature-sized and legal-sized males during 1999-2003 were comparable to those during 1993-1998 (Vining and Zheng 2004), and the closure of the fishery for red king crabs since 1999 was not a response to low abundance estimates for mature-sized and legal-sized crabs. Instead, the Pribilof red king crab fishery was closed due to conservation concerns resulting from two sources of uncertainty.

The first source of uncertainty concerns the potential for bycatch of blue king crabs during prosecution of the red king crab fishery. The blue king crab bycatch concerns are difficult to substantiate. There is scant fishery observer data from historic Pribilof District king crab fisheries and, except for catch and effort by ADF&G statistical area obtained during dockside interviews or recorded on fish tickets, little information is available on the distribution of either red or blue king crabs during the fall fishery. Commercial catch statistics only provide information on legal-sized males in statistical areas that are too large (approximately 900 nmi<sup>2</sup>) to provide needed information on distribution. Nonetheless, a large proportion of the annual harvest of both red and blue king crabs occurred in a single statistical area (Figure 1, statistical

area 695700) directly east of St. Paul Island (Morrison and Gish 1994, 1996, 1997a, 1997b; Morrison et al. 1998, 1999), which suggests that the potential for blue king crab bycatch in a directed red king crab fishery may be significant.

The second source of uncertainty is the reliability of population estimates for Pribilof red king crab afforded by the NMFS eastern Bering Sea trawl survey. Population estimates for this stock have low precision due to the low number of survey tows in which red king crabs are captured in the Pribilof District (NPFMC *in prep*, Rugolo et al. 2006, Vining and Zheng 2008). The low precision of the Pribilof red king crab stock estimates raises concerns for management of both the red king crab stock and protection of the blue king crab stock. Establishment of fishery harvest levels on the basis of low precision estimates could result in overfishing of the red king crab stock and in a prolonged fishery that would increase the exposure of the blue king crab stock to the effects of bycatch during the fishery.

In 2003, ADF&G conducted a pot survey of the Pribilof Islands area to document the distribution and relative abundance of red and blue king crab during what would normally have been the fall fishing season. Low catch rates of king crab obtained during that survey documented the depressed nature of the blue king crab stocks and the uncertainty of the red king crab trawl survey results. The results of that survey did show there was considerable overlap in distribution of legal red king crab and all blue king crab when encountered (Gish and Pengilly 2004). The results also indicated that the station catch rates of red king crab and blue king crab were inversely correlated; when higher numbers of red king crab were encountered the number of blue king crab were low and vice versa.

The department conducted a second survey in 2005 which expanded the area covered north and east (Gish 2006). Despite the expanded effort red king crab catches were 80% lower for legal males and 38% lower for sublegal males as compared to 2003. Blue king crab catches displayed a similar pattern: legal males were 58% lower, sublegal males were 69% lower and females were 48% lower as compared to 2003. The catch of female red king crabs, however, was substantially higher in 2005 and almost all were ovigerous.

Since the 2004 NMFS survey, the ADF&G-estimated numbers of mature-sized and legal males have steadily decreased to the lowest observed since the fishery closure in 1998 (Vining and Zheng 2008). Therefore, in addition to the closure of the Pribilof red king crab fishery due to the above two sources of uncertainty, there are increasing concerns regarding the status of red king crab stocks around the Pribilof Islands due to low abundance.

The purpose of this project is to determine the potential for a commercial red king crab fishery in the Pribilof District without the risk of significant bycatch of blue king crabs. It is designed to determine the distribution and relative abundance of red and blue king crabs proximate to the period of a commercial fishery, were it to occur, and to determine if red king crabs could be exploited with little or no blue king crab bycatch. The survey area reflects the area of highest concentration of effort observed during the fisheries from 1993 through 1998 and encompasses the area where king crabs were encountered during the 2003 and 2005 ADF&G surveys.



## OBJECTIVES

Prioritized objectives of the 2008 Pribilof District king crab survey are as follows:

1. Document distribution and relative abundance of red and blue king crabs in the Pribilof District of the Bering Sea, Area Q, just prior to the period that a commercial fishery for these crabs would normally occur.
  - a. Obtain biological data from all commercially important crab and fish species encountered during the survey.
  - b. Map benthic habitat types for both red and blue king crabs around the Pribilof Islands.
  - c. Obtain a sediment sample from each benthic habitat type and obtain underwater video of each benthic habitat type in conjunction with each sediment grab sample.
  - d. Obtain measures of conductivity, temperature and depth concurrent with catch per pot data over the range of depths fished.
2. Conduct simulated commercial fishing (“niche” fishing) activity ancillary to the survey to obtain finer-scale information to assess ability of the survey to estimate the distribution and relative densities of red and blue king crabs when areas of any concentration are encountered.
  - a. Obtain biological data from all red and blue king crabs encountered during niche fishing.
  - b. Map benthic habitat types for both red and blue king crabs around the Pribilof Islands during niche fishing.
  - c. Obtain a sediment sample from each benthic habitat type and obtain underwater video of each benthic habitat type in conjunction with each sediment grab sample.
  - d. Obtain measures of conductivity, temperature and depth concurrent with catch per pot data over the range of depths fished.
3. Collect hemolymph samples from red and blue king crabs for genetic studies; collect ovary, otolith and stomach samples from yellow Irish lords *Hemilepidotus jordani*, bigmouth sculpins *Hemitripterus bolini*, and great sculpins *Myoxocephalus polyacanthocephalus* for life history and ecosystem studies; and collect crab and fish specimens for reference collections.

## METHODS

### CHARTER ITINERARY

The 35-day survey will be conducted aboard the chartered vessel *F/V Scandies Rose* (a 39.6-m commercial crab-pot-fishing vessel) from approximately September 6 through October 10, 2008 in the Pribilof District of the Bering Sea Management Area Q. The charter will begin and end in Dutch Harbor. The captain, a minimum of three crew members, one of which is an engineer, and four ADF&G staff biologists will be aboard the entire period of the charter. Details are provided in the Shipboard Instructions (Appendix A).

## **KING CRAB DISTRIBUTION AND RELATIVE ABUNDANCE SURVEY**

### **Survey Area and Design**

The primary survey area (Figure 2) encompasses the Pribilof Islands and is bounded by 56° 30' N latitude to the south, 57° 30' N latitude to the north, 169° 00' W longitude to the east, and 171° 00' W longitude to the west. The survey area covers approximately 3,600 nmi<sup>2</sup> and includes the ADF&G shellfish statistical areas that accounted for 83% to 99% of the total annual Pribilof Islands red king crab harvests for the 1993 through 1998 seasons (Morrison and Gish 1994, 1996, 1997a, 1997b; Morrison et al. 1998, 1999). In particular, the survey area includes statistical area 695700 (bounded by 57° 00' N latitude, 57° 30' N latitude, 169° 00' W longitude, and 170° 00' W longitude). This statistical area accounted for the largest portion of the total Pribilof red king crab harvest during 1993-1998 (36%) and of the total Pribilof Islands blue king crab harvest during 1995-1998 (42%). Hence, the survey area includes the area of highest historical fishery production for the red king crab fishery and an area of potentially high blue king crab bycatch.

The survey station pattern was designed by first designating stations at the centers and corners of the stations established for the NMFS eastern Bering Sea trawl survey (Stevens et al. 2002) located within the primary survey area. Additional stations were added to achieve 5-nmi spacing between stations for a total of 164 primary stations. One-hundred-eighteen secondary stations (maintaining the 5-nmi spacing) were added to the north and east of the primary stations for a total of 282 stations (Appendix B). The goal is for a minimum of 240 stations to be fished during the pot survey.

Each station will consist of 4 pots arrayed in a north-south orientation and each pot will be 0.125 nmi apart; the center of each station will be a minimum of 5 nmi apart. Stations will only be fished once during the survey. Each pot will measure 7' x 7' x 2.8', be fitted with 2.75" stretch mesh on all webbing, and have two opposing tunnel openings measuring 8" x 36". The target soak time interval for each pot will be 24 to 30 hours. Each pot will be baited with two 2-quart containers of chopped herring *Clupea pallasii* and one Pacific cod *Gadus macrocephalus* will be used as hanging bait.

The goal during this survey is to sample a minimum of 9 stations (36 pots) per day. The number of stations attempted per day may be adjusted contingent upon existing conditions and constraints in order to maximize effort during the charter. The vessel will be able to transit to the next pot while the contents of each current pot are sampled as there is no requirement to stay "on station" while the catch is sampled. Individual pot locations, set and pull dates and times, depth, bottom type, data logger number (if appropriate) and gear performance will be recorded by the vessel captain in the Pilot House Log (Appendix C1) for all fishing conducted during the survey. All catch per pot data, summarized by station, will be entered in a spreadsheet application during the survey and reported to the Kodiak office daily. It is anticipated that approximately 960 pots will be sampled during the survey.

### **Catch Sampling**

Species composition will be determined for each pot fished during the survey, and all commercially important crab species will be enumerated to provide catch per pot data by size and sex. The fork or total length will be recorded for all commercially important fish species and all other fish and invertebrate species will be identified and enumerated. All crabs and fish will be released alive after sampling except for those identified in the following "Ancillary

Collections” section. All catch per pot data, summarized by station, will be entered daily into a spreadsheet application and reported to the Kodiak ADF&G office for the duration of the survey.

Each red and blue king crab and hair crab *Erimacrus isenbeckii* obtained from survey pots will be sexed and measured for carapace length (CL) to the nearest millimeter. Carapace length will be measured from the posterior margin of the right eye socket to the midpoint of the rear margin of the carapace (Donaldson and Byersdorfer 2005). Each Tanner crab *Chionoecetes bairdi* will be sexed and measured for carapace width (CW), to the nearest tenth (0.1) of a millimeter for males and to the nearest millimeter for females. Each snow crab *C. opilio* will be sexed and measured for CW to the nearest millimeter. Carapace width will be measured as the greatest straight line distance (excluding spines) across the carapace at a right angle to a line midway between the eyes to the midpoint of the posterior margin of the carapace (Jadamec et al. 1999). Additionally, the chela height (CH), measured as the greatest height on the right chela excluding spines (Jadamec et al. 1999), of all male Tanner crabs that show no evidence of regeneration will be recorded to the nearest tenth (0.1) of a millimeter. The fishery-legal status of male crabs will be determined by the CW, including spines, relative to minimum legal size (6.5 inches for red and blue king crab, 3.25 inches for hair crab, 5.5 inches for Tanner crab, and 3.1 inches for snow crab).

The shell condition of each crab will be determined by examining the ventral side of the coxa (shoulders) of the walking legs (pereiopods) for discoloration and deterioration from scratching and other abrasive action attributable to prolonged contact of the crab’s shell with the substrate. Although the following categories were developed for shell-condition assessment of red king crabs, each can also be applied to other commercially important crab species encountered during the survey. Record shell condition for each crab sampled as follows:

- New-shell, pliable – The exoskeleton is shiny, with few or no scratches or pits present. Carapace is easily punctured, torn, or damaged with few or no epibionts present. Dactyls and spines are sharp with no wear present. Gills are translucent to light cream in color.
- New-shell – Exoskeleton is usually hard and meri are not easily compressed by pinching, ventral surface with limited or no scratching. Legs are mostly full of meat and will crack if bent. Dorsally, the exoskeleton ranges in color from purple to brick red to yellowish-brown on dorsal surface. Ventral surface of exoskeleton ranges from white to "dullish" white. Carapace is firm to hard, and mostly clean but may have slight fouling, including small barnacles, encrusting bryozoans, adult leeches and leech cocoons. Spines and dactyls are sharp but may show slight wear. Gills are light cream in color.
- Old-shell – Exoskeleton, particularly the ventral surface, shows scratching, wear, and abrasions. Exoskeleton and chela are hard and cannot be indented by thumb pressure. Legs are full of meat, meri are not easily compressed when pinched. Chela tips are dull and "teeth" may be worn. Spines and dactyls are worn and typically dull at the tips. Distal portion of the ventral coxa is partially or totally covered with brown scratches or dots. Exoskeleton covered with light to moderate fouling, including barnacles, bryozoans, leeches, and leech cocoons. Barnacles and other epibionts are usually present. Gills are tan in color.
- Very old-shell – Exoskeleton and chela are hard and cannot be indented by thumb pressure. Legs are full of meat and meri are not easily compressed when pinched.

Carapace is hard, chela tips are dull and "teeth" are worn. Spines rounded with tips sometimes worn off, dactyls are worn, rounded, and black. Distal portion of the ventral coxa is covered with black scratches or dots. Exoskeleton, particularly the ventral surface, has numerous scratches, wear, and abrasions, it appears dark and dull, ranging from deep purple to brick red to yellowish-brown on dorsal surface. Gills are dark gray or gray-black in color.

Very, very old-shell      Exoskeleton and chela are generally hard and cannot be indented by thumb pressure, but some individuals may be decaying and the carapace may be spongy. Legs are full of meat and meri are not easily compressed when pinched. Carapace is hard or spongy with visible wear, chela tips are rounded and "teeth" are very worn. Spines rounded with tips often worn off, dactyls are worn, rounded or flattened, and black. Distal portion of the ventral coxa is black. Exoskeleton, particularly the ventral surface, has numerous scratches, wear, and abrasions; it appears dark and dull.

Complete shell condition information for king crabs is given in Donaldson and Byersdorfer (2005), and for Tanner and snow crab in Jadamec et al. (1999).

The reproductive condition of all female crabs will be determined. If eggs are present, clutch fullness, clutch condition, egg development, and color of eggs will be recorded. Clutch fullness refers to the size of the clutch in reference to a full clutch and the abdominal flap. Clutch condition refers to the absence (and the condition of the setae if eggs are absent) or presence of dead eggs (and amount of dead eggs, if present). Egg development refers to the presence of uneyed or eyed eggs, and whether hatching is apparent. Other biological characteristics of crabs including limbs loss and the presence of disease or parasites will be documented. Record all required data on the Crab Measurement Form and the Species Composition Form (Appendix C2 and C3).

A subsample of male and female red and blue king crabs for carapace length distribution, shell condition, and female reproductive data may be taken. Subsampling of pot catches will only be done when successive pots within a station contain a large number of crabs; subsampling will only be done when sampling the full pot contents would either impact crab vitality on deck or unnecessarily delay overall survey progress. The subsample goal will be a minimum of 100 males and 100 females and will be randomly taken before non-measured crabs are counted and released. Catch sampling of the remaining crabs will consist of full enumeration of red and blue king crabs by category. The categories of king crab are: legal males, legal male recruits (new-shell crabs <150-mm CL), prerecruit ones (mature sublegal males  $\geq$ 120-mm CL), males <120-mm CL, mature female crabs (matted setae or eggs present), and immature females (clean setae). The total count by sex and size category will be recorded on the Crab Subsampling Form (Appendix C4).

All commercially important species such as Pacific cod *Gadus macrocephalus*, walleye pollock *Theragra chalcogramma*, sablefish *Anoplopoma fimbria*, Pacific halibut *Hippoglossus stenolepis*, Greenland turbot *Reinhardtius hippoglossoides*, yellowfin sole *Limanda aspera*, northern rock sole *Lepidopsetta polyxystra*, flathead sole *Hippoglossoides elassodon*, northern rockfish *Sebastes polyspinis*, Atka mackerel *Pleurogrammus monopterygius*, arrowtooth flounder *Artheresthes stomias*, and Kamchatka flounder *Artheresthes evermanni* will be measured and lengths recorded on the Fish Length Form (Appendix C5). All captured fishes (not

listed on the Fish Length Form) and invertebrates (not listed on the Crab Measurement Form or Crab Subsampling Form; Appendix C2 and C4) will be identified to species, if possible, and recorded on the Species Composition Form (Appendix C3).

### **Ancillary Collections**

Biological and specimen collections for universities and another agency will be obtained as time allows throughout the at-sea deployment. Non-lethal hemolymph samples from red and blue king crabs will be collected for genetic studies by the University of Alaska, Juneau by inserting a syringe where the arthroal membrane is exposed (see Appendix D1). Ovary and stomach samples will be obtained from yellow Irish lords, bigmouth sculpins and great sculpins for life history and ecosystem studies by NMFS, Alaska Fishery Science Center (see Appendix D2). Ad hoc collections of crabs for an invertebrate reference collection at the Division of Laboratory Animal Resources at the University of Pittsburgh and some fish may be retained for the comparative skeletal reference collection at the Aleutian Campus of the University of Alaska, Fairbanks if the appropriate species are encountered. Additionally, shell condition photographs of red and blue king crabs, Tanner crabs, snow crabs and hair crabs will be taken for inclusion in a reference collection for training purposes.

### **Benthic Habitat Mapping and Sampling**

#### **Benthic Habitat Mapping**

Data on benthic habitat type, or seabed classification, will be obtained during this charter using QTC VIEW<sup>1</sup> methodology (Quester Tangent Corporation 2004b). It will consist of acquiring the first return ping or waveform. This waveform varies according to the characteristic texture of the surficial seafloor sediment (the frequency distribution of grain sizes) or the immediate subsurface. These waveforms are then classified into groups; the groups correspond to different bottom types. The location of these bottom types are correlated with a dedicated DGPS/WAAS navigation system and using QTC IMPACT<sup>1</sup> software to produce a color image of differing bottom types or benthic habitat (Quester Tangent Corporation 2004a). Data files created by QTC VIEW will be downloaded to an external hard drive and daily. Backup files will be created weekly throughout the trip. Record all system adjustments on the QTC VIEW Log (Appendix C6).

#### **Benthic Habitat Sampling**

A minimum of one benthic sediment sample will be obtained from each bottom type to help ground-truth the echo sounder data return. The sediment samples will be classified according to the percentage of mud, sand, and gravel contained in each sample (Folk 1954). Samples will be obtained using a Van Veen grab and recorded on the Benthic Sampling and Underwater Video Log (Appendix C7).

#### **Underwater Video Operation**

Underwater video, obtained with a drop camera, will be taken in each bottom habitat type to visually document the sediment or substrate type and recorded (Appendix C7). Every effort will be made to obtain this video from the site sampled by the Van Veen grab.

### **Oceanographic and Weather Data Collection**

The oceanographic parameters of temperature, depth and salinity (conductivity), concurrent with red king crab CPUE, data will be obtained from selected pots. Three submersible temperature

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<sup>1</sup> Use of trade name does not constitute an endorsement by ADF&G.

(STR), seven temperature/depth (TDR), and seven conductivity/temperature/depth (CTD) data loggers will be deployed in a manner that provides coverage over the range of area and depths fished during the survey. No more than one data logger will be deployed at any single station. Continuous water temperature reference data will be obtained by the deployment of two additional STRs at yet to be determined locations for the duration of the survey; additionally, continuous air temperature reference data will be obtained by the deployment of one additional STR on deck for the duration of the survey. Deployment of each data logger will be documented in the Pilot House Log (Appendix C1). Weather observations will be made throughout the survey and niche fishing. The vessel captain will record these observations as each station is set and retrieved and as each niche fishing string is set and retrieved. Additional observations may be made by any personnel on the bridge at any time. All observations will be recorded on the Weather Observation Form (Appendix C8).

### **“NICHE” FISHING**

In addition to and concurrent with the survey, pots will also be fished at locations around and between survey stations (“niche” fishing). Niche fishing will occur in areas of current and previous high concentrations of legal male red king crabs ( $CPUE \geq 20$  crabs per pot lift). Pots fished during niche fishing will be arrayed as “strings” similar to the setting of pots during commercial fishing, with the pots within strings spaced by approximately 0.25 nmi (0.46 km). Choice of niche-fishing locations will be based on results from this current survey, the 2003 and 2005 ADF&G surveys, and the vessel captain’s experience in the area. The same pots and configuration of those pots, as well as the same bait will be used during niche fishing as in the survey. Target soak time for niche-fishing pots will be 24 to 30 hours.

Catch sampling during niche fishing will consist of, all sampling activities described above for the survey. However, a subsample of male and female red and blue king crabs for carapace length distribution, shell condition, and female reproductive data may be taken. Subsampling of pot catches will only be done when successive pots contain a large number of crabs; subsampling will only be done when sampling the full pot contents would either impact crab vitality on deck or unnecessarily delay overall survey progress. The subsample goal will be a minimum of 100 males and 100 females and will be randomly taken before non-measured crabs are counted and released. Catch sampling of the remaining crabs will consist of full enumeration of red and blue king crabs by category. The categories of king crab are: legal males, legal male recruits (newshell crabs <150-mm CL), prerecruit ones (mature sublegal males  $\geq 120$ -mm CL), males <120-mm CL, mature female crabs (matted setae or eggs present), and immature females (clean setae). The total count by sex and size category will be recorded on the Crab Subsampling Form (Appendix C4).

Benthic habitat mapping and sampling, as well as oceanographic data collection as described for the survey will occur during niche fishing. Individual pot locations, set and pull dates and times will be recorded by the vessel captain in the Pilot House Log (Appendix C1) for all niche fishing conducted. All catch per pot data will be entered into a spreadsheet application and reported to the Kodiak office daily.

### **DATA ANALYSIS**

Distribution of catch of legal-sized male red king crabs during the survey will be analyzed relative to five sex-size classes of blue king crab: male blue king crabs  $\geq 120$ -mm CL, male blues king crab <120-mm CL, mature female blue king crabs, immature female blue king crabs, and

total blue king crabs. The CPUE will be mapped by station to compare spatial distribution of legal red king crabs with each of the five blue king crab sex-size classes.

Several measures of the spatial association between legal male red king crabs and each of the five blue king crab sex-size classes will be investigated for application to the station catch per unit of effort (CPUE; defined as catch per pot lift) data; the appropriateness of these measures will depend on the properties of the catch data collected during the survey. Candidate measures of association are:

1. correlation of station CPUE for legal red king crabs with that for each of the five blue king crab sex-size classes;
2. MacArthur-Levin niche overlap (Krebs 1999) of legal red king crabs on each of the five blue king crab sex-size classes;
3. MacArthur-Levin niche overlap of each of the five blue king crab sex-size classes on legal red king crabs;
4. percent of station co-occurrence for legal red king crabs with each of the five blue king crab sex-size classes;
5. and, percent of station co-occurrence for each of the five blue king crab sex-size classes with legal red king crabs.

Association of CPUE with depth will be investigated through exploratory graphical methods, the appropriate choice of which will be dependent on the data collected. The likely method will be to prepare box-plots of station CPUE for legal male red king crabs and each of the five blue king crab sex-size classes plotted against bins of depth ranges (e.g., 5-fathom depth ranges). Those results may suggest hypotheses for statistical testing of different responses of CPUE to depth by legal male red king crabs and the five blue king crab sex-size classes.

Dependent upon ability to classify bottom habitat, distribution relative to habitat type will also be analyzed. Classified habitat types will be mapped over the map of the survey area and the maps of red and blue king crab survey distribution. Dependent on results, these data may lend themselves to analysis via computation of the MacArthur-Levin niche overlap measures relative to benthic habitat type and exploratory graphical analyses of CPUE response to habitat type as described above.

Association of CPUE with temperature will also be investigated through exploratory graphical methods, the appropriate choice of which will be dependent on the data collected. The likely method will be to prepare box-plots of station CPUE for legal male red king crabs and each of the five blue king crab sex-size classes plotted against bins of temperature ranges (e.g., 1° Celsius temperature ranges). Those results may suggest hypotheses for statistical testing of different responses of CPUE to temperature by legal male red king crabs and the five blue king crab sex-size classes.

## **SCHEDULES AND PERSONNEL**

The following tasks will be completed by the designated personnel by the dates listed below:

| Month/Day   | Personnel                     | Activity   |
|-------------|-------------------------------|--|
| 01/02-08/31 | Gish and Pengilly             | Project planning, vessel charter procurement, operational plan, shipboard instructions |
| 09/10-10/14 | Gish, Burt, Slater and Renfro | Conduct at-sea survey  |
| 11/01-12/31 | Chisum                        | Enter survey data electronically   |
| 12/01-12/31 | Gish and Alinsunurin          | Edit survey data   |

## **REPORTS**

The following reports will be written by the designated authors by the dates listed below:

| Month/Year | Author(s)         | Report  |
|------------|-------------------|---|
| 08/08      | Gish              | Project operational plan for the 2008 Pribilof District king crab project |
| 11/08      | Gish              | Memorandum on the 2008 Pribilof District king crab survey                 |
| 04/09      | Gish and Pengilly | The 2008 Pribilof District king crab survey                               |

## **ACKNOWLEDGEMENTS**

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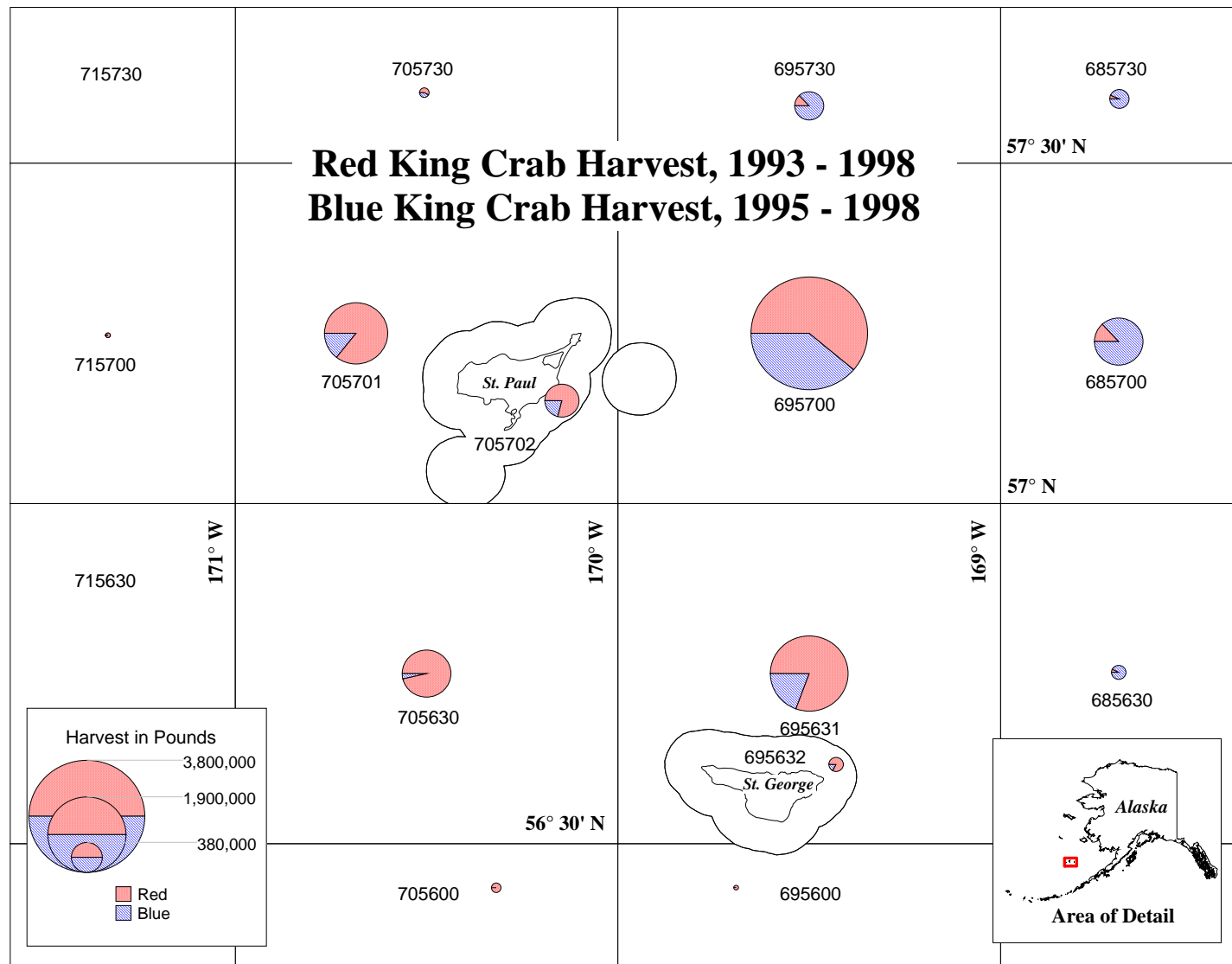
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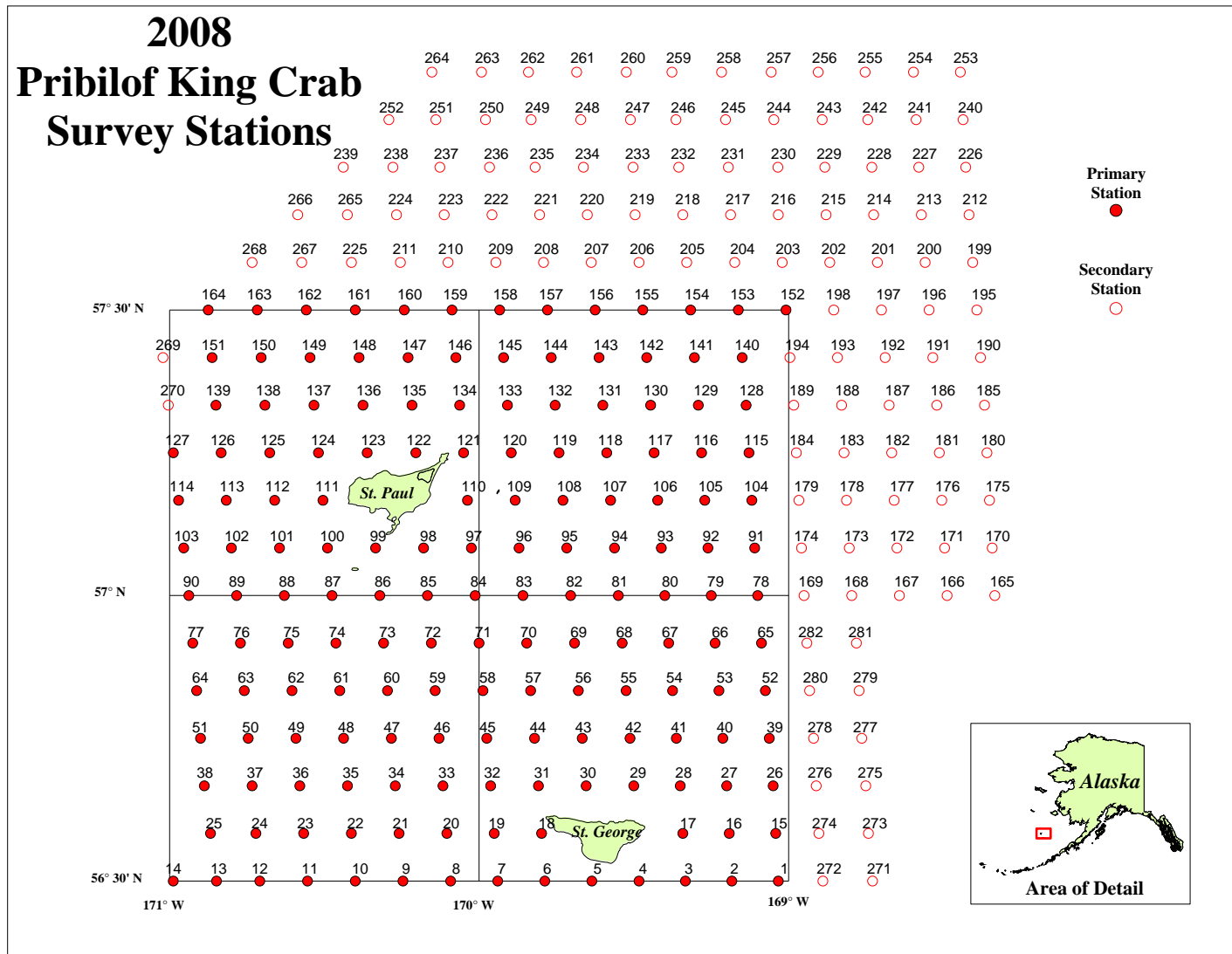
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## **FIGURES**



**Figure 1.-**Location and amount of king crab harvest in the Pribilof District, 1993 to 1998.



**Figure 2.-**Area of the 2008 Pribilof District king crab survey showing the location of each station.



**APPENDIX A. SHIPBOARD INSTRUCTIONS FOR THE 2008  
PRIBILOF DISTRICT KING CRAB SURVEY.**

Alaska Department of Fish and Game  
Westward Region  
211 Mission Road  
Kodiak, Alaska 99615

August 2008

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### GENERAL INFORMATION

The purpose of this manual is to provide additional information and instructions relating to the 2008 Pribilof District king crab survey. Refer to it for project objectives and sampling procedures. Expect standard methodologies but be prepared to accept changes to sampling procedures and protocols when circumstances warrant.

By regulation, all survey data is confidential until the closure of the Pribilof District king crab commercial fishery, which by regulation is from October 15, 2008 through February 1, 2009. As this fishery has been closed since 1999 due to the overfished status of the blue king crab stock, it is likely that the fishery will be closed preseason.

The survey will be aboard the charter vessel the F/V *Scandies Rose*, a 39.6-m pot-fishing vessel. The vessel and her crew have been contracted to provide service to ADF&G for the 35-day period, the general itinerary is as follows:

| Dates                   | Activity                                   |
|-------------------------|--|
| September 4 - 5         | Install equipment, work and load gear      |
| September 6             | Travel to grounds, survey set gear         |
| September 7 - October 8 | Set/pull survey and/or niche gear          |
| October 9               | Pull survey or niche gear, depart grounds  |
| October 10              | Travel to port, offload equipment and gear |

The crew leader is responsible for resolving any misunderstandings arising between the vessel crew and ADF&G biologists in regard to the charter service requirements; also, the crew leader will resolve any misunderstandings arising among the ADF&G biologists.

Insubordination to the crew leader or the vessel captain will result in immediate suspension from at-sea duties, and may result in the immediate return of that individual to port.

Following is the list of personnel participating in this year's king crab charter:

| ADF&G Crew                        | Vessel Crew               |
|-----------------------------------|---------------------------|
| Skip Gish - crew leader           | Dan Mattsen - captain     |
| Ryan Burt - assistant crew leader | Bryce Buholm - crewman    |
| Laura Slater - biologist          | Brett Wilson - crewman    |
| Kevin Renfro - biologist          | William Engstom - crewman |
| t                                 | Rex Dutton - crewman      |

### *Safety Briefing*

Prior to commencement of the survey, the captain will provide the ADF&G crew with a shipboard safety orientation which will include pulling the general alarm and the designation of emergency stations. Specific information will be provided for each of the following:

1. General safety orientation: The location of life rafts, fire stations, medical supplies, safety placards, emergency information, and safe/hazardous areas on deck.

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2. Shipboard safety drill: Where personnel should be and what to do in emergency situations; the locations of survival suits and EPIRBs.
3. Abandon ship, man overboard and fire-fighting drills will be conducted in the presence of U.S.C.G. personnel prior to departure.

The safety and well being of the vessel and ADF&G crew as well as the vessel itself are the primary concern at all times during the charter. Obey the captain in this regard, as he is legally responsible for ensuring the safety of all onboard personnel. Do not go on the back deck or anywhere outside alone, especially when seas are rough. When gear is being worked, pay particular attention to buoy lines and trailers, pots, and slick decks. ADF&G personnel will not stack pots, operate hydraulics, or throw buoy lines. Be aware of the crane and hydraulic blocks at all times, particularly when pots are being moved. Retreat to a safe area previously designated by the captain while pots are being set, retrieved, moved, or stacked.

Specific information and/or vessel policies will be provided for each of the following: storage location for rain gear and boots, galley etiquette, water use policy (showers, laundry, dishes, bathroom), etc.

Prior to departure, it is the responsibility of each ADF&G crewmember to check their personal EPIRB, strobe light, and survival suit; also lubricate or wax the survival suit zipper to insure proper functioning. Rules concerning EPIRB testing may be obtained from the U. S. Coast Guard in Dutch Harbor (581-3466). Check date on strobe light battery, replace battery if dated or faulty. Tested EPIRBs and strobe lights are to be securely fastened to survival suits.

#### ***Miscellaneous Shipboard Rules and Information***

During the charter, tasks and responsibilities will be delegated among the onboard ADF&G crew for the duration of the cruise. Any problems that arise should be channeled through the crew leader. Clean up all work areas used, including the galley table. All data should be kept organized and as dry as possible. Make sure deck paperwork tracks with the Pilot House Log; every pot will have a unique number that will enable cross-referencing on a pot by pot basis. Although it is the crew leader's responsibility to ensure data integrity, other ADF&G crew will be relied upon for assistance. Be sure to ask the crew leader about any unexpected changes in sampling protocols or anything else related to data collection when clarification is needed.

Completed data forms will be edited daily. This practice ensures that the often-important short-term details of the day's events are not overlooked. There will be no compromise with regard to this responsibility. If time permits, the vessel pilothouse logs will be entered into a spreadsheet on a daily basis using the laptop computer.

Prior to the vessel's departure from Dutch Harbor to the survey grounds, check off all items on the equipment list (Appendix E) including forms, sampling equipment, and personal gear (e.g., seasick medications). Maintain all sampling equipment by ensuring it is cleaned and stored safely inside the vessel at the end of each day (calipers, clipboards, measuring sticks, etc.).

Keep a daily log of sampling activities, hours worked, contingencies, miscellaneous observations, Floy tag recoveries, sampling irregularities, etc. Included in the daily log should also be observations on conditions under which the survey was conducted, such as daily temperature, wind, and sea conditions. Any problems or concerns with survey procedures should also be noted in the daily log. This log would also be appropriate for recording any photographs taken.

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Offer assistance to the vessel crew whenever possible. ADF&G personnel are allowed to help out with some of the deck activities that are not inherently dangerous, such as filling bait containers. When time allows, washing dishes, making coffee, cooking and general cleaning should be part of our daily routine.

The vessel crew will have a busier schedule than the ADF&G crew; a cooperative effort toward daily chores and maintaining living quarters on the vessel can be a great benefit to everyone's morale.

There will be no home packing of any animals captured during the survey by vessel or ADF&G crewmembers. All halibut (dead or alive) are to be placed overboard immediately. It is acceptable to consume cod, groundfish and other mortally injured crabs while at sea. Authorization for the collection of crabs for display or other purposes will be by the crew leader only.

#### **Additional Instructions and Reminders**

1. Review project operational plan and charter itinerary.
2. Leave timesheets with Kathleen Herring in Dutch Harbor; project coding of regular and premium sea pay must be reviewed by the crew leader prior to submission of the timesheet.

| Pay Codes    |                   |                   |
|--------------|-------------------|-------------------|
| Personnel    | Regular Pay       | Sea/Hazard Pay    |
| Skip Gish    | 11340665/11340665 | 11100841/11148763 |
| Ryan Burt    | 11340665/11340665 | 11100841/11148763 |
| Laura Slater | 11340665/11340665 | 11100841/11148763 |
| Kevin Renfro | 11100041/11140763 | 11100041/11140763 |

3. Turn in all receipts for purchases to the crew leader prior to September 5.
4. Check your survival suit, strobe light, and EPIRB prior to departure.
5. The Pilot House Logs must be completed daily; complete every column in every form as required.

### **METHODS**

#### ***Catch Reporting***

A daily status report on charter activities will be transmitted to ADF&G in Kodiak. The crew leader, designated crewmember, or the vessel captain will relay this status report. The report will contain the status or well being of the vessel and crew; the report may also contain the total number of pots sampled and the numbers of legal-sized male red and all blue king crabs by station or niche string as outlined on the Email / Radio Log provided in Appendix C9. This report will be by internet/Immarsat email or by single side band (SSB) radio.

Email will be our primary means of contact and reporting during this charter. Doug Pengilly will serve as the primary contact, if Doug is not available the report will be sent to Leslie Watson. Email addresses are [doug.pengilly@alaska.gov](mailto:doug.pengilly@alaska.gov) and [patricia.conley@alaska.gov](mailto:patricia.conley@alaska.gov). The information to be sent by email is listed above.

If email is not possible, a radio schedule will be maintained with the Dutch Harbor office to verify the well being of the vessel and crew, and to transmit the above report via code. This radio contact on SSB 4125 will be at 10:00 AM; if this schedule is missed a second check will occur at 2:30 PM. The ADF&G

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office call sign is WIM 76 DUTCH HARBOR; call sign for the F/V *Scandies Rose* is WUT 4391. Krista Milani will serve as the primary contact for any radio schedule; Tammy Chisum will be the secondary contact person. Catch information will be sent using the following codes:

| Number | Codes   |         | Number | Codes    |         |
|--------|---------|---------|--------|----------|---------|
| 0      | Whiskey | Charlie | 4      | Yankee   | Kilo    |
| 00     | Romeo   | Quebec  | 5      | Golf     | Delta   |
| 000    | Oscar   | X-ray   | 6      | Bravo    | Tango   |
| 1      | Echo    | Mike    | 7      | Foxtrot  | Uniform |
| 2      | Juliet  | Hotel   | 8      | November | Sierra  |
| 3      | Papa    | Victor  | 9      | India    | Alpha   |

Prior to departure a shore-based contact for the F/V *Scandies Rose* will be established, and will be available as an additional contact method. This vessel contact information will be sent to Doug Pengilly (907) 486-1865, Leslie Watson (907) 486-6190, Krista Milani and Tammy Chisum (907) 581-1239.

#### ***Pilot House Log***

The charter vessel captain will complete the Pilot House Log (Appendix C1) for each pot fished. Each pot will be assigned a Sequential Pot Number (SPN) in the order it is set, beginning with 1 and continuing throughout the charter. The SPNs are extremely important as they link pot locations, depths fished and soak time to the catch data. It is the responsibility of the lead biologist and/or the ADF&G biologists to insure the completion of this task. Check to ensure that the log is completely filled out at the end of each day.

#### ***Survey Design***

Refer to the operational plan for a description of the survey pattern and pot deployment. The charter period is 35 days in length, approximately 33 days will be at sea. The at-sea portion will consist of 2 components: the survey and niche fishing. It is anticipated that the survey portion of the charter will last approximately 26 days, including travel to the fishing grounds. Other activities, including niche fishing, equipment testing, travel to port, and loading and offloading gear will encompass the remaining 9 days of the charter period.

#### **Catch Sampling**

The contents of each pot fished will be examined for species composition. Red and blue king crabs, hair crabs, Tanner crabs, and snow crabs from each pot will be fully enumerated to provide catch per pot by sex and size data. Record all required data on the Crab Measurement Form and Species Composition Form (Appendices C2 and C3). Record all data for each species according to protocols outlined below.

Prior to sampling each pot, the ADF&G biologists will ask the captain to convey (via the loud hailer) the appropriate SPN and record it on the Crab Measurement Form (Appendix C2). Sequential pot numbers for lost pots along with the words “LOST POT” will be recorded on a blank row on the Crab

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Measurement Form. Likewise, if a retrieved pot is unbaited, the SPN is still recorded and the words “NO BAIT” written on the Crab Measurement Form.

**Recording Data.** When sorting, divide all crabs by species, and if possible, subdivide by sex. Separate data sheets must be used for each pot. It is preferable to use separate data sheets for each species, however it is permissible to record separate species of the same sex on the same sheet but they must be delimited by skipping a few lines between each. Before sampling each pot, complete all header information (i. e. station number, date, buoy number, measurer, recorder) and record the SPN (obtained from the captain) on the survey data form. Once sampling has commenced, record the appropriate code for each data category using the choices provided at the bottom of the survey data form.

**Morphometrics.** Carapace length (CL) measurements to the nearest millimeter will be taken for all king crabs and hair crabs encountered. Carapace width (CW) measurements will be taken to the nearest millimeter for snow crabs and to the nearest 0.1 millimeter for Tanner crabs. Additionally, the chela height (CH) of all male Tanner crabs will be measured to the nearest 0.1 millimeter. These measurements will be used to help re-evaluate the legal size of Tanner crabs west of 166° West longitude. Extra care should be taken to obtain accurate measurements.

Legal status will be determined for all male crabs encountered. Legal size is determined by measuring the carapace width including the spines. There is considerable size overlap of sublegal and legal-sized male red king crabs with the same CL; therefore, either a measuring stick or calipers should be used to verify the legal measurement of all king crabs less than 140-mm CL.

| Species        | Minimum CW (inches) |
|----------------|---------------------|
| Red King Crab  | 6.5                 |
| Blue King Crab | 6.5                 |
| Tanner Crab    | 5.5                 |
| Snow Crab      | 3.1                 |
| Hair Crab      | 3.25                |

**Shell Condition.** The carapace or shell condition of each crab will be determined by examining the ventral side of the coxa (shoulders) of the walking legs (pereiopods) for discoloration and deterioration from scratching and other abrasive action attributable to prolonged contact of the crab’s shell with the substrate. Record shell age for each crab sampled as follows:

| Shell Age Category | Code |
|--------------------|------|
| New-pliable        | 9    |
| New                | 2    |
| Old                | 3    |
| Very Old           | 4    |
| Very, very Old     | 5    |

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Other biological characteristics of all crabs that should be given special attention during sampling include the following:

Egg color – normally appears purple (code # 8) or brown (code # 10) for uneyed eggs, or orange (code # 4) for eyed eggs.

Egg development – under the egg development column, uneyed eggs (code # 1) is the most common. However, it is of special interest if hatching embryos (code # 3) are encountered.

Diseases – black mat (code # 5), cottage cheese (code # 7) and shell disease (also known as shell rust, code # 8) are the most commonly occurring disease in red king crabs. Bitter crab disease (code # 6) may be encountered in Tanner crabs.

Catch sampling during niche fishing will consist of, at a minimum, full enumeration of legal red king crabs and all blue king crabs by category (Appendix C4). The categories of blue king crab are: male blue king crab  $\geq 120$ -mm CL, male blue king crab  $< 120$ -mm CL, mature female blue king crab, and immature female blue king crab. If there is sufficient time during niche fishing gear retrieval, all sampling activities described above for the survey portion will be performed and recorded on the appropriate form (Appendix C2 and Appendix C3).

### **Benthic Habitat Mapping and Sampling**

***Benthic Habitat Mapping.*** The QTC system needs a dedicated computer and DGPS, access to an echo sounder and transducer, and a power source protected with an UPS power supply. Refer to the QTC VIEW manual for installation instructions (Quester Tangent Corporation 2004a). The system will be installed in Dutch Harbor by Harris Electric and, if time allows, the system will be ground-truthed on Chelan Bank prior to departure. Data acquisition will commence when the vessel reaches the study area and will occur at all times the vessel is underway. Document all adjustments to settings on the QTC VIEW form (Appendix C6)

***Benthic Sampling and Underwater Video Operations.*** A sediment sample will be taken by the use of a Van Veen grab. Each sample will be emptied into to a one-gallon zip-lock type bag, labeled with date, time, latitude and longitude, and placed into the bait freezer. Underwater video of each sample site will be obtained using a drop camera to visually document the habitat type. Both the grab sampler and drop camera will be operated at or near slack tide to ensure successful operation. Record all activity on the benthic sampling form (Appendix C7)

### **Oceanographic Data Collection**

The oceanographic parameters of temperature, conductivity (salinity), and depth will be obtained by the use of 7 CTD, 7 TDR and 7 STR data loggers. Additionally, one STR will be placed on deck by where the pots are stacked overnight. Loggers will be secured inside the pots by a carabiner and two door hooks with rubbers in a manner that restricts movement during deployment. Record lost or damaged loggers, or additional data loggers on the data logger form (Appendix C10).

### **Photographic Documentation of Research Activities**

Whenever time permits, all aspects of research activities including the handling and measuring of crabs, clutch size and egg development and various shell ages aboard the charter vessel should be documented

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with photographs and video. Edited video footage provides the best means of documenting the survey operation for future reference. A digital camera, 35-mm SLR camera and film, and an 8-mm format camcorder (with blank tapes) have been included in the survey equipment inventory. Note: All photographs should be documented with a short written caption relevant to what is being filmed (i.e., date, time, location and subject).

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**APPENDIX B. STATION LOCATIONS FOR THE 2008  
PRIBILOF DISTRICT KING CRAB SURVEY.**

**Appendix B1.**—Location of station centers for the 2008 Pribilof District king crab survey; each station consists of four pots arrayed in a north – south orientation.

| Primary<br>Station | Latitude |         | Longitude |         | Primary<br>Station | Latitude |         | Longitude |         |
|--------------------|----------|---------|-----------|---------|--------------------|----------|---------|-----------|---------|
|                    | Degrees  | Minutes | Degrees   | Minutes |                    | Degrees  | Minutes | Degrees   | Minutes |
| 1                  | 56       | 30.00   | 169       | 02.00   | 34                 | 56       | 40.00   | 170       | 16.25   |
| 2                  | 56       | 30.00   | 169       | 11.00   | 35                 | 56       | 40.00   | 170       | 25.50   |
| 3                  | 56       | 30.00   | 169       | 20.00   | 36                 | 56       | 40.00   | 170       | 34.75   |
| 4                  | 56       | 30.00   | 169       | 29.00   | 37                 | 56       | 40.00   | 170       | 44.00   |
| 5                  | 56       | 30.00   | 169       | 38.13   | 38                 | 56       | 40.00   | 170       | 53.25   |
| 6                  | 56       | 30.00   | 169       | 47.25   | 39                 | 56       | 45.00   | 169       | 03.75   |
| 7                  | 56       | 30.00   | 169       | 56.38   | 40                 | 56       | 45.00   | 169       | 12.75   |
| 8                  | 56       | 30.00   | 170       | 05.50   | 41                 | 56       | 45.00   | 169       | 21.75   |
| 9                  | 56       | 30.00   | 170       | 14.75   | 42                 | 56       | 45.00   | 169       | 30.75   |
| 10                 | 56       | 30.00   | 170       | 24.00   | 43                 | 56       | 45.00   | 169       | 40.00   |
| 11                 | 56       | 30.00   | 170       | 33.25   | 44                 | 56       | 45.00   | 169       | 49.25   |
| 12                 | 56       | 30.00   | 170       | 42.50   | 45                 | 56       | 45.00   | 169       | 58.50   |
| 13                 | 56       | 30.00   | 170       | 50.89   | 46                 | 56       | 45.00   | 170       | 07.75   |
| 14                 | 56       | 30.00   | 170       | 59.28   | 47                 | 56       | 45.00   | 170       | 17.00   |
| 15                 | 56       | 35.00   | 169       | 02.50   | 48                 | 56       | 45.00   | 170       | 26.25   |
| 16                 | 56       | 35.00   | 169       | 11.50   | 49                 | 56       | 45.00   | 170       | 35.50   |
| 17                 | 56       | 35.00   | 169       | 20.50   | 50                 | 56       | 45.00   | 170       | 44.75   |
| 18                 | 56       | 35.00   | 169       | 47.88   | 51                 | 56       | 45.00   | 170       | 54.00   |
| 19                 | 56       | 35.00   | 169       | 57.06   | 52                 | 56       | 50.00   | 169       | 04.50   |
| 20                 | 56       | 35.00   | 170       | 06.25   | 53                 | 56       | 50.00   | 169       | 13.50   |
| 21                 | 56       | 35.00   | 170       | 15.50   | 54                 | 56       | 50.00   | 169       | 22.50   |
| 22                 | 56       | 35.00   | 170       | 24.75   | 55                 | 56       | 50.00   | 169       | 31.50   |
| 23                 | 56       | 35.00   | 170       | 34.00   | 56                 | 56       | 50.00   | 169       | 40.75   |
| 24                 | 56       | 35.00   | 170       | 43.25   | 57                 | 56       | 50.00   | 169       | 50.00   |
| 25                 | 56       | 35.00   | 170       | 52.07   | 58                 | 56       | 50.00   | 169       | 59.25   |
| 26                 | 56       | 40.00   | 169       | 03.00   | 59                 | 56       | 50.00   | 170       | 08.50   |
| 27                 | 56       | 40.00   | 169       | 12.00   | 60                 | 56       | 50.00   | 170       | 17.75   |
| 28                 | 56       | 40.00   | 169       | 21.00   | 61                 | 56       | 50.00   | 170       | 27.00   |
| 29                 | 56       | 40.00   | 169       | 30.00   | 62                 | 56       | 50.00   | 170       | 36.25   |
| 30                 | 56       | 40.00   | 169       | 39.25   | 63                 | 56       | 50.00   | 170       | 45.50   |
| 31                 | 56       | 40.00   | 169       | 48.50   | 64                 | 56       | 50.00   | 170       | 54.75   |
| 32                 | 56       | 40.00   | 169       | 57.75   | 65                 | 56       | 55.00   | 169       | 05.25   |
| 33                 | 56       | 40.00   | 170       | 07.00   | 66                 | 56       | 55.00   | 169       | 14.25   |

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**Appendix B1.**—Page 2 of 5.

| Primary<br>Station | Latitude |         | Longitude |         | Primary<br>Station | Latitude |         | Longitude |         |
|--------------------|----------|---------|-----------|---------|--------------------|----------|---------|-----------|---------|
|                    | Degrees  | Minutes | Degrees   | Minutes |                    | Degrees  | Minutes | Degrees   | Minutes |
| 67                 | 56       | 55.00   | 169       | 23.25   | 101                | 57       | 5.00    | 170       | 38.69   |
| 68                 | 56       | 55.00   | 169       | 32.25   | 102                | 57       | 5.00    | 170       | 48.00   |
| 69                 | 56       | 55.00   | 169       | 41.50   | 103                | 57       | 5.00    | 170       | 57.25   |
| 70                 | 56       | 55.00   | 169       | 50.75   | 104                | 57       | 10.00   | 169       | 07.12   |
| 71                 | 56       | 55.00   | 170       | 00.00   | 105                | 57       | 10.00   | 169       | 16.25   |
| 72                 | 56       | 55.00   | 170       | 09.25   | 106                | 57       | 10.00   | 169       | 25.37   |
| 73                 | 56       | 55.00   | 170       | 18.50   | 107                | 57       | 10.00   | 169       | 34.50   |
| 74                 | 56       | 55.00   | 170       | 27.75   | 108                | 57       | 10.00   | 169       | 43.75   |
| 75                 | 56       | 55.00   | 170       | 37.00   | 109                | 57       | 10.00   | 169       | 53.00   |
| 76                 | 56       | 55.00   | 170       | 46.25   | 110                | 57       | 10.00   | 170       | 02.25   |
| 77                 | 56       | 55.00   | 170       | 55.50   | 111                | 57       | 10.00   | 170       | 30.25   |
| 78                 | 57       | 0.00    | 169       | 06.00   | 112                | 57       | 10.00   | 170       | 39.62   |
| 79                 | 57       | 0.00    | 169       | 15.00   | 113                | 57       | 10.00   | 170       | 49.00   |
| 80                 | 57       | 0.00    | 169       | 24.00   | 114                | 57       | 10.00   | 170       | 58.25   |
| 81                 | 57       | 0.00    | 169       | 33.00   | 115                | 57       | 15.00   | 169       | 07.69   |
| 82                 | 57       | 0.00    | 169       | 42.25   | 116                | 57       | 15.00   | 169       | 16.87   |
| 83                 | 57       | 0.00    | 169       | 51.50   | 117                | 57       | 15.00   | 169       | 26.06   |
| 84                 | 57       | 0.00    | 170       | 00.75   | 118                | 57       | 15.00   | 169       | 35.25   |
| 85                 | 57       | 0.00    | 170       | 10.00   | 119                | 57       | 15.00   | 169       | 44.50   |
| 86                 | 57       | 0.00    | 170       | 19.25   | 120                | 57       | 15.00   | 169       | 53.75   |
| 87                 | 57       | 0.00    | 170       | 28.50   | 121                | 57       | 15.00   | 170       | 03.00   |
| 88                 | 57       | 0.00    | 170       | 37.75   | 122                | 57       | 15.00   | 170       | 12.25   |
| 89                 | 57       | 0.00    | 170       | 47.00   | 123                | 57       | 15.00   | 170       | 21.69   |
| 90                 | 57       | 0.00    | 170       | 56.25   | 124                | 57       | 15.00   | 170       | 31.13   |
| 91                 | 57       | 5.00    | 169       | 06.56   | 125                | 57       | 15.00   | 170       | 40.56   |
| 92                 | 57       | 5.00    | 169       | 15.62   | 126                | 57       | 15.00   | 170       | 50.00   |
| 93                 | 57       | 5.00    | 169       | 24.69   | 127                | 57       | 15.00   | 170       | 59.25   |
| 94                 | 57       | 5.00    | 169       | 33.75   | 128                | 57       | 20.00   | 169       | 08.25   |
| 95                 | 57       | 5.00    | 169       | 43.00   | 129                | 57       | 20.00   | 169       | 17.50   |
| 96                 | 57       | 5.00    | 169       | 52.25   | 130                | 57       | 20.00   | 169       | 26.75   |
| 97                 | 57       | 5.00    | 170       | 01.50   | 131                | 57       | 20.00   | 169       | 36.00   |
| 98                 | 57       | 5.00    | 170       | 10.75   | 132                | 57       | 20.00   | 169       | 45.25   |
| 99                 | 57       | 5.00    | 170       | 20.06   | 133                | 57       | 20.00   | 169       | 54.50   |
| 100                | 57       | 5.00    | 170       | 29.38   | 134                | 57       | 20.00   | 170       | 03.75   |

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**Appendix B1.**–Page 3 of 5.

| Primary Station   | Latitude |         | Longitude |         | Primary Station   | Latitude |         | Longitude |         |
|-------------------|----------|---------|-----------|---------|-------------------|----------|---------|-----------|---------|
|                   | Degrees  | Minutes | Degrees   | Minutes |                   | Degrees  | Minutes | Degrees   | Minutes |
| 135               | 57       | 20.00   | 170       | 13.00   | 150               | 57       | 25.00   | 170       | 42.25   |
| 136               | 57       | 20.00   | 170       | 22.50   | 151               | 57       | 25.00   | 170       | 51.75   |
| 137               | 57       | 20.00   | 170       | 32.00   | 152               | 57       | 30.00   | 169       | 00.50   |
| 138               | 57       | 20.00   | 170       | 41.50   | 153               | 57       | 30.00   | 169       | 09.75   |
| 139               | 57       | 20.00   | 170       | 51.00   | 154               | 57       | 30.00   | 169       | 19.00   |
| 140               | 57       | 25.00   | 169       | 09.00   | 155               | 57       | 30.00   | 169       | 28.25   |
| 141               | 57       | 25.00   | 169       | 18.25   | 156               | 57       | 30.00   | 169       | 37.50   |
| 142               | 57       | 25.00   | 169       | 27.50   | 157               | 57       | 30.00   | 169       | 46.75   |
| 143               | 57       | 25.00   | 169       | 36.75   | 158               | 57       | 30.00   | 169       | 56.00   |
| 144               | 57       | 25.00   | 169       | 46.00   | 159               | 57       | 30.00   | 170       | 05.25   |
| 145               | 57       | 25.00   | 169       | 55.25   | 160               | 57       | 30.00   | 170       | 14.50   |
| 146               | 57       | 25.00   | 170       | 04.50   | 161               | 57       | 30.00   | 170       | 24.00   |
| 147               | 57       | 25.00   | 170       | 13.75   | 162               | 57       | 30.00   | 170       | 33.50   |
| 148               | 57       | 25.00   | 170       | 23.25   | 163               | 57       | 30.00   | 170       | 43.00   |
| 149               | 57       | 25.00   | 170       | 32.75   | 164               | 57       | 30.00   | 170       | 52.50   |
|                   |          |         |           |         |                   |          |         |           |         |
| Secondary Station | Latitude |         | Longitude |         | Secondary Station | Latitude |         | Longitude |         |
|                   | Degrees  | Minutes | Degrees   | Minutes |                   | Degrees  | Minutes | Degrees   | Minutes |
| 165               | 57       | 00.00   | 168       | 20.04   | 176               | 57       | 10.00   | 168       | 30.30   |
| 166               | 57       | 00.00   | 168       | 29.28   | 177               | 57       | 10.00   | 168       | 39.54   |
| 167               | 57       | 00.00   | 168       | 38.52   | 178               | 57       | 10.00   | 168       | 48.78   |
| 168               | 57       | 00.00   | 168       | 47.76   | 179               | 57       | 10.00   | 168       | 58.00   |
| 169               | 57       | 00.00   | 168       | 57.00   | 180               | 57       | 15.00   | 168       | 21.54   |
| 170               | 57       | 05.00   | 168       | 20.52   | 181               | 57       | 15.00   | 168       | 30.78   |
| 171               | 57       | 05.00   | 168       | 29.76   | 182               | 57       | 15.00   | 168       | 40.02   |
| 172               | 57       | 05.00   | 168       | 39.00   | 183               | 57       | 15.00   | 168       | 49.26   |
| 173               | 57       | 05.00   | 168       | 48.24   | 184               | 57       | 15.00   | 168       | 58.50   |
| 174               | 57       | 05.00   | 168       | 57.50   | 185               | 57       | 20.00   | 168       | 22.02   |
| 175               | 57       | 10.00   | 168       | 21.06   | 186               | 57       | 20.00   | 168       | 31.26   |

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| Secondary<br>Station | Latitude |         | Longitude |         | Secondary<br>Station | Latitude |         | Longitude |         |
|----------------------|----------|---------|-----------|---------|----------------------|----------|---------|-----------|---------|
|                      | Degrees  | Minutes | Degrees   | Minutes |                      | Degrees  | Minutes | Degrees   | Minutes |
| 187                  | 57       | 20.00   | 168       | 40.50   | 221                  | 57       | 40.00   | 169       | 48.25   |
| 188                  | 57       | 20.00   | 168       | 49.74   | 222                  | 57       | 40.00   | 169       | 57.50   |
| 189                  | 57       | 20.00   | 168       | 59.00   | 223                  | 57       | 40.00   | 170       | 06.75   |
| 190                  | 57       | 25.00   | 168       | 22.80   | 224                  | 57       | 40.00   | 170       | 16.00   |
| 191                  | 57       | 25.00   | 168       | 32.04   | 225                  | 57       | 35.00   | 170       | 24.73   |
| 192                  | 57       | 25.00   | 168       | 41.28   | 226                  | 57       | 45.00   | 168       | 25.67   |
| 193                  | 57       | 25.00   | 168       | 50.52   | 227                  | 57       | 45.00   | 168       | 34.77   |
| 194                  | 57       | 25.00   | 168       | 59.75   | 228                  | 57       | 45.00   | 168       | 43.87   |
| 195                  | 57       | 30.00   | 168       | 23.52   | 229                  | 57       | 45.00   | 168       | 52.97   |
| 196                  | 57       | 30.00   | 168       | 32.76   | 230                  | 57       | 45.00   | 169       | 02.07   |
| 197                  | 57       | 30.00   | 168       | 42.00   | 231                  | 57       | 45.00   | 169       | 11.69   |
| 198                  | 57       | 30.00   | 168       | 51.24   | 232                  | 57       | 45.00   | 169       | 21.31   |
| 199                  | 57       | 35.00   | 168       | 24.30   | 233                  | 57       | 45.00   | 169       | 30.15   |
| 200                  | 57       | 35.00   | 168       | 33.54   | 234                  | 57       | 45.00   | 169       | 39.77   |
| 201                  | 57       | 35.00   | 168       | 42.78   | 235                  | 57       | 45.00   | 169       | 49.13   |
| 202                  | 57       | 35.00   | 168       | 52.02   | 236                  | 57       | 45.00   | 169       | 57.97   |
| 203                  | 57       | 35.00   | 169       | 01.25   | 237                  | 57       | 45.00   | 170       | 07.59   |
| 204                  | 57       | 35.00   | 169       | 10.44   | 238                  | 57       | 45.00   | 170       | 16.69   |
| 205                  | 57       | 35.00   | 169       | 19.75   | 239                  | 57       | 45.00   | 170       | 26.31   |
| 206                  | 57       | 35.00   | 169       | 29.00   | 240                  | 57       | 50.00   | 168       | 26.19   |
| 207                  | 57       | 35.00   | 169       | 38.25   | 241                  | 57       | 50.00   | 168       | 35.29   |
| 208                  | 57       | 35.00   | 169       | 47.50   | 242                  | 57       | 50.00   | 168       | 44.65   |
| 209                  | 57       | 35.00   | 169       | 56.75   | 243                  | 57       | 50.00   | 168       | 53.49   |
| 210                  | 57       | 35.00   | 170       | 06.00   | 244                  | 57       | 50.00   | 169       | 02.85   |
| 211                  | 57       | 35.00   | 170       | 15.25   | 245                  | 57       | 50.00   | 169       | 12.21   |
| 212                  | 57       | 40.00   | 168       | 25.02   | 246                  | 57       | 50.00   | 169       | 21.83   |
| 213                  | 57       | 40.00   | 168       | 34.26   | 247                  | 57       | 50.00   | 169       | 30.67   |
| 214                  | 57       | 40.00   | 168       | 43.50   | 248                  | 57       | 50.00   | 169       | 40.29   |
| 215                  | 57       | 40.00   | 168       | 52.74   | 249                  | 57       | 50.00   | 169       | 49.91   |
| 216                  | 57       | 40.00   | 169       | 02.00   | 250                  | 57       | 50.00   | 169       | 58.75   |
| 217                  | 57       | 40.00   | 169       | 11.25   | 251                  | 57       | 50.00   | 170       | 08.37   |
| 218                  | 57       | 40.00   | 169       | 20.50   | 252                  | 57       | 50.00   | 170       | 17.47   |
| 219                  | 57       | 40.00   | 169       | 29.75   | 253                  | 57       | 55.00   | 168       | 26.71   |
| 220                  | 57       | 40.00   | 169       | 39.00   | 254                  | 57       | 55.00   | 168       | 35.81   |

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| Secondary<br>Station | Latitude |         | Longitude |         | Secondary<br>Station | Latitude |         | Longitude |         |
|----------------------|----------|---------|-----------|---------|----------------------|----------|---------|-----------|---------|
|                      | Degrees  | Minutes | Degrees   | Minutes |                      | Degrees  | Minutes | Degrees   | Minutes |
| 255                  | 57       | 55.00   | 168       | 45.17   | 269                  | 57       | 25.00   | 171       | 01.27   |
| 256                  | 57       | 55.00   | 168       | 54.27   | 270                  | 57       | 20.00   | 171       | 00.23   |
| 257                  | 57       | 55.00   | 169       | 03.37   | 271                  | 56       | 30.00   | 168       | 43.74   |
| 258                  | 57       | 55.00   | 169       | 12.99   | 272                  | 56       | 30.00   | 168       | 53.34   |
| 259                  | 57       | 55.00   | 169       | 22.61   | 273                  | 56       | 35.00   | 168       | 44.52   |
| 260                  | 57       | 55.00   | 169       | 31.45   | 274                  | 56       | 35.00   | 168       | 54.12   |
| 261                  | 57       | 55.00   | 169       | 41.07   | 275                  | 56       | 40.00   | 168       | 45.04   |
| 262                  | 57       | 55.00   | 169       | 50.43   | 276                  | 56       | 40.00   | 168       | 54.64   |
| 263                  | 57       | 55.00   | 169       | 59.53   | 277                  | 56       | 45.00   | 168       | 45.82   |
| 264                  | 57       | 55.00   | 170       | 09.15   | 278                  | 56       | 45.00   | 168       | 55.16   |
| 265                  | 57       | 40.00   | 170       | 25.53   | 279                  | 56       | 50.00   | 168       | 46.33   |
| 266                  | 57       | 40.00   | 170       | 35.15   | 280                  | 56       | 50.00   | 168       | 55.94   |
| 267                  | 57       | 35.00   | 170       | 34.37   | 281                  | 56       | 55.00   | 168       | 46.85   |
| 268                  | 57       | 35.00   | 170       | 43.99   | 282                  | 56       | 55.00   | 168       | 56.45   |

## **APPENDIX C. SURVEY DATA FORMS AND INSTRUCTIONS**

Appendix C1.–Survey pilot house log.

Survey Pilot House Log

Vessel Name: \_\_\_\_\_ Survey Code: \_\_\_\_\_ ADF&G Number: \_\_\_\_\_  
Captain Name: \_\_\_\_\_ Page \_\_\_\_\_ of \_\_\_\_\_

| SPN | STATION<br>NUMBER | BUOY ID | SET GEAR           |                     | DEPTH<br>(fathoms) | BOTTOM<br>TYPE<br>(see below) | LOCATION                   |                                    | LOGGER<br>ID | LIFT GEAR          |                     | GEAR<br>PERF.<br>(see below) |
|-----|-------------------|---------|--------------------|---------------------|--------------------|-------------------------------|----------------------------|------------------------------------|--------------|--------------------|---------------------|------------------------------|
|     |                   |         | DATE<br>(mm/dd/yy) | TIME<br>(0000-2359) |                    |                               | LATITUDE (N)<br>(dd°mm.mm) | LONGITUDE<br>(ddd°mm.mm)<br>E or W |              | DATE<br>(mm/dd/yy) | TIME<br>(0000-2359) |                              |
| 1   |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 2   |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 3   |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 4   |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 5   |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 6   |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 7   |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 8   |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 9   |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 10  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 11  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 12  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 13  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 14  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 15  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 16  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 17  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 18  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 19  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |
| 20  |                   |         |                    |                     |                    |                               |                            |                                    |              |                    |                     |                              |

BOTTOM TYPE:  
1 = rock      4 = mud  
2 = sand      5 = gravel  
3 = silt

GEAR PERFORMANCE:  
blank = good      41 = pot door bent or not tied  
40 = lost pot      42 = pot not baited  
43 = pot landed upside down



### INSTRUCTIONS FOR SURVEY PILOT HOUSE LOG

This form is used to record fishing parameters for every pot that is set during the survey. It is the definitive table in the survey database and must be accurately completed each day gear is set or pulled.

**Survey Code:** To be determined.

**ADF&G Number:** The ADF&G number of the vessel.

**Vessel Name:** The name of the vessel.

**Captain's Name:** The name of the captain filling out the data forms.

**Page \_\_\_\_ of \_\_\_\_ :** The pages of this form will be numbered sequentially as they are generated over the course of the survey. When the last page is numbered, that number will be written in the 2<sup>nd</sup> blank on all the pages. For example: A total of 47 Pilot House Log pages were used during the survey. 'Page 1 of 47' would be on the first page, and 'Page 47 of 47' would be on the last page.

**Sequential Pot Number (SPN):** As pots are set, the captain will number them beginning at '1' and then number each successive pot sequentially over the course of the survey. Sequential pot numbers are unique and **will not** be reused if a pot is lost.

**Station Number:** The captain will record the station number for each sequential pot set. For our survey, there will be one station number per 4-pot string. If a station is resampled, the numeral 2 will precede the new station number in a 4-digit format. For example: station 6 has been reset and will be documented as station 2006. Similarly, station 141 has been reset and is identified as station 2141.

**Buoy ID:** The ID and/or letters marked on the trailer buoy of the pot buoy set-up will be recorded.

#### Set Gear

- **Date:** The captain will record the date the gear is set, in mm/dd/yy format.
- **Time:** The captain will record the time the gear is set, in local Alaska time and in 24-hour format (0000 – 2359). '0000' is midnight and denotes the beginning of the next day.

**Depth:** The captain will record depth in whole fathoms, or to the tenth of a fathom if electronically displayed.

**Bottom Type:** Enter one of five bottom type codes as listed at the bottom of the form.

**Location -** As the gear is set, the captain will record:

- **Latitude (N)** in degrees and decimal minutes - dd°mm.mm, and
- **Longitude (E or W)** in degrees and decimal minutes - ddd°mm.mm. All pots in this survey will be set in west longitude; circle the letter 'W' on each Pilot House Log. Latitude and longitude may be recorded in either of two ways, e.g., 52°15.77' or as a string of numbers with symbols and decimal points omitted '521577'.

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-continued-

**Logger ID:** The temperature data logger ID number will be recorded in the same row as the sequential pot number in which it was deployed.

**Lift Gear**

- **Date:** The captain will record the date the gear is pulled, in mm/dd/yy format.
- **Time:** The captain will record the time the gear is pulled, in local Alaska time and in 24-hour format (0000 – 2359). ‘0000’ is midnight and denotes the beginning of the next day.

**Gear Performance:** Gear performance will be assessed for every pot pulled. Codes to be used are at the bottom of the form.

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## Appendix C2.–Crab measurement form.

### Crab Measurement Form

Sample Date (mm/dd/yy): \_\_\_\_\_

Station Number: \_\_\_\_\_

SPN: \_\_\_\_\_ Buoy ID: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_

Survey Code: \_\_\_\_\_

Recorder: \_\_\_\_\_

Measurer(s): \_\_\_\_\_

Logger ID: \_\_\_\_\_

Tag Series: \_\_\_\_\_

| S<br>P<br>E<br>C<br>I<br>E<br>S | S<br>E<br>X | CARAPACE<br>SIZE<br>(mm) | CHELA<br>HEIGHT<br>(mm) | L<br>E<br>G<br>A<br>L | S<br>I<br>Z<br>E | C<br>O<br>N<br>D<br>I<br>T<br>I<br>O<br>N | F<br>E<br>M<br>A<br>L<br>E | M<br>A<br>T<br>U<br>R<br>I<br>T<br>Y | E<br>G<br>G<br>S                     |   |                            |                       | C<br>O<br>N<br>D<br>I<br>T<br>I<br>O<br>N | P<br>A<br>R<br>A<br>S<br>I<br>T<br>E<br>S | T<br>A<br>G<br>N<br>U<br>M<br>B<br>E<br>R | C<br>O<br>M<br>M<br>E<br>N<br>T<br>S |
|---------------------------------|-------------|--------------------------|-------------------------|-----------------------|------------------|---|----------------------------|--------------------------------------|--------------------------------------|---|----------------------------|-----------------------|---|---|---|--------------------------------------|
|                                 |             |                          |                         |                       |                  |   |                            |                                      | F<br>U<br>L<br>L<br>N<br>E<br>S<br>S | D<br>E<br>V<br>E<br>L<br>O<br>P<br>M<br>E<br>N<br>T | C<br>L<br>U<br>T<br>C<br>H | C<br>O<br>L<br>O<br>R |   |   |   |                                      |
| 1                               |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 2                               |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 3                               |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 4                               |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 5                               |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 6                               |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 7                               |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 8                               |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 9                               |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 10                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 11                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 12                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 13                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 14                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 15                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 16                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 17                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 18                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 19                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 20                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 21                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 22                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 23                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 24                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |
| 25                              |             |                          |                         |                       |                  |   |                            |                                      |                                      |   |                            |                       |   |   |   |                                      |

**SPECIES CODES:**  
 1 = golden king  
 2 = red king  
 3 = blue king  
 4 = hair crab  
 5 = hybrid, *C. bairdi* x *C. opilio*  
 6 = *C. bairdi*  
 7 = *C. opilio*  
 8 = *C. angulatus*  
 9 = Dungeness  
 10 = *L. covei*  
 11 = *C. tanneri*  
 12 = *P. multispina*  
 13 = *P. verilli*  
 41 = hybrid, *C. bairdi*  
 42 = hybrid, *C. opilio*

**SEX:**  
 0 = unknown  
 1 = male  
 2 = female  
 3 = hermaphrodite

**SHELL CONDITION:**  
 0 = premolt/molting  
 1 = soft  
 9 = new, pliable  
 2 = new  
 3 = old  
 4 = very old  
 5 = very, very old

**LEGAL SIZE:**  
 0 = sublegal  
 1 = legal, retained  
 2 = legal, not retained

**FEMALE MATURITY:**  
 0 = unknown  
 1 = immature  
 2 = mature  
 3 = mature, primiparous  
 4 = mature, multiparous

**CONDITION:**  
 blank = uninjured  
 1 = fresh injury  
 2 = dead  
 3 = previously dead

**E  
G  
G  
S**

**CLUTCH FULLNESS:**  
 0 = no eggs  
 1 = trace to 1/8 full  
 2 = 1/4 full  
 3 = 1/5 full  
 4 = 3/4 full  
 5 = 100% full

**EGG DEVELOPMENT:**  
 1 = uneyed eggs  
 2 = eyed eggs  
 3 = hatching

**CLUTCH CONDITION:**  
 1 = no dead eggs  
 2 = dead eggs < 20%  
 3 = dead eggs > 20%  
 4 = barren / clean setae  
 5 = barren / matted setae  
 6 = no setae

**EGG COLOR:**  
 0 = other  
 1 = cream  
 2 = tan  
 3 = yellow  
 4 = orange  
 5 = dark orange  
 6 = pink  
 7 = reddish  
 8 = purple  
 9 = purple-brown  
 10 = brown  
 11 = brownish-black

**PARASITES:**  
 blank = not examined  
 0 = none  
 1 = *B. callosus*  
 2 = nemertean worms  
 3 = bitter crab  
 4 = other  
 5 = black mat  
 6 = CCB  
 7 = cottage cheese  
 8 = turbellarian worms  
 9 = pepper crab  
 10 = snailfish eggs  
 12 = leatherback

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-continued-

### INSTRUCTIONS FOR CRAB MEASUREMENT FORM

This form is used to record selected crab species from sampled pots. At least one form will be filled out for every sequential pot number set. If a pot contains zero crab, make a large null symbol ‘Ø’ on the center of the form. If multiple sexes or species are sampled on the form, a blank line will separate those changes. Enter the Survey Code and fill in the Sample Date, Station Number, Sequential Pot Number, Buoy ID, and Logger ID fields as directed in the *Survey Pilot House Log* instructions.

**Sample Date:** Record the date that the pot was sampled, in mm/dd/yy format.

**Recorder:** Write the initials of the person recording the data.

**Measurer(s):** Write the initials of the person(s) measuring crabs.

**Page \_\_\_\_ of \_\_\_\_ :** The pages of this form will be numbered sequentially within each SPN sampled. When the last page of an SPN is completed, that number will be written in the 2<sup>nd</sup> blank on all the pages. For example: A total of 4 crab measurement pages were used to record data for an SPN. ‘Page 1 of 4’ would be on the first page, and ‘Page 4 of 4’ would be on the last page.

**Species Code:** Record the species code of the sampled crab from the list at the bottom of the form.

**Sex:** Record the sex of the crab as noted at the bottom of the form.

**Carapace Size (mm):** Record the carapace length of king and hair crabs in mm CL. For Tanner and Dungeness, record the carapace width in mm CW.

**Chela Height (mm):** Record the chela height of the right chela of male Tanner crabs in mm CH. Measure only those chela that do not display evidence of regeneration.

**Legal Size:** Record the legal size/retention status code of male crabs only; record code ‘0’ for sublegal males and code ‘2’ for all legal males sampled during the survey.

**Shell Condition:** Record the shell condition of each crab sampled as noted at the bottom of the form.

**Female Maturity:** Record the maturity status of each crab sampled. Codes 3 and 4 only apply to *Chionoecetes* crabs.

**Eggs –** When mature female crabs are sampled, the following data fields will be completed using the codes listed at the bottom of the form.

- **Clutch Fullness:** Ranges as fractional percentage from no eggs (0%) to 100% full.
- **Egg Development:** Eggs will be eyed, uneyed, or hatching.
- **Clutch Condition:** Presence of dead eggs OR presence of clean or matted setae.
- **Egg Color:** Egg color will be the closest match to colors displayed in the standard color chart.

**Condition:** The crab is uninjured (*blank*), newly-injured, dead, or previously dead.

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-continued-

**Parasite(s):** Record all codes that apply to the sampled crab. This field will be *blank* if a crab was not examined for parasites. Multiple parasites can be recorded, separated by commas (e.g., 1, 10).

**Tag Series:** N/A – Not recorded during this survey.

**Tag Number:** N/A – Not recorded during this survey.

**Comments:** Note items specific to the sampled crab e.g., severely injured, extensive bleeding, poor overall condition), and other observations not captured in required form fields.

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# **Appendix C3.—Species composition form.**

## **Species Composition Form**

Sample Date (mm/dd/yy): \_\_\_\_\_ Vessel Name: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ Survey Code: \_\_\_\_\_ Recorder: \_\_\_\_\_

|    | SPN | STATION<br>NUMBER | BUOY ID | SPECIES NAME | SPECIES<br>CODE<br>(NMFS RACE) | TOTAL<br>NUMBER | COMMENTS |
|----|-----|-------------------|---------|--------------|--------------------------------|-----------------|----------|
| 1  |     |                   |         |              |                                |                 |          |
| 2  |     |                   |         |              |                                |                 |          |
| 3  |     |                   |         |              |                                |                 |          |
| 4  |     |                   |         |              |                                |                 |          |
| 5  |     |                   |         |              |                                |                 |          |
| 6  |     |                   |         |              |                                |                 |          |
| 7  |     |                   |         |              |                                |                 |          |
| 8  |     |                   |         |              |                                |                 |          |
| 9  |     |                   |         |              |                                |                 |          |
| 10 |     |                   |         |              |                                |                 |          |
| 11 |     |                   |         |              |                                |                 |          |
| 12 |     |                   |         |              |                                |                 |          |
| 13 |     |                   |         |              |                                |                 |          |
| 14 |     |                   |         |              |                                |                 |          |
| 15 |     |                   |         |              |                                |                 |          |
| 16 |     |                   |         |              |                                |                 |          |
| 17 |     |                   |         |              |                                |                 |          |
| 18 |     |                   |         |              |                                |                 |          |
| 19 |     |                   |         |              |                                |                 |          |
| 20 |     |                   |         |              |                                |                 |          |
| 21 |     |                   |         |              |                                |                 |          |
| 22 |     |                   |         |              |                                |                 |          |
| 23 |     |                   |         |              |                                |                 |          |
| 24 |     |                   |         |              |                                |                 |          |
| 25 |     |                   |         |              |                                |                 |          |

### **FREQUENTLY ENCOUNTERED SPECIES -PRIBILOF ISLANDS**

|                                |                               |                             |
|--------------------------------|-------------------------------|-----------------------------|
| 471 = Alaska skate             | 78403 = giant octopus         | 68578 = Pacific lyre crab   |
| 10120 = Pacific halibut        | 80590 = knobby 6-ray seastar  | 69010 = hermit crab unident |
| 10210 = yellowfin sole         | 80595 = Leptasterias unident. | 69086 = fuzzy hermit crab   |
| 20510 = sablefish (black cod)  | 81095 = rose sea star         | 71500 = snail unident.      |
| 21370 = Great sculpin          | 81780 = common mud star       | 71820 = Pribilof neptune    |
| 21720 = Pacific cod            | 82510 = green sea urchin      | 71882 = fat whelk           |
| 21740 = walleye pollock        | 83000 = brittlestar unident.  | 72743 = angled buccinum     |
| 40011 = hydroid unident.       | 83020 = basketstar            | 72751 = sinuous whelk       |
| 40500 = jellyfish unident.     | 83320 = notched brittlestar   | 72752 = silky buccinum      |
| 68577 = Circumboreal toad crab | 91000 = sponge unident.       | 72755 = polar whelk         |

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-continued-

### INSTRUCTIONS FOR THE SPECIES COMPOSITION FORM

This form is used to record total numbers of all identified species from sampled pots, except for the crab species documented on the *Crab Measurement Form*. If there are no species other than measured crabs in the pot, make a null symbol ‘Ø’ in the Species Name column for that SPN.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, Station Number, Bouy ID, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form.

**Species Name:** Write the common name, or if unavailable, the scientific name of each animal caught.

**Species Code:** Except as noted below, record the 5-digit NMFS RACE code of each identified animal. Commonly-encountered species near the Pribilof Islands are listed at the bottom of the form; refer to the supplied 2007 NMFS Species Code Book for additional codes. If an animal cannot be identified to species at the time of sampling, note the genus or family name and write the corresponding code on the form. When photographs or specimens are taken for later positive identification, note that in the Comments section (below).

**Total Number:** By species or taxon, record the total number of animals caught in each pot.

**Comments:** Anything related to individual species listed on the form (photograph taken, specimen collected, preliminary identification, etc.).

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# Appendix C4.—Crab subsampling form.

## Crab Subsampling Form – 2008 Pribilof District King Crab Survey

Sample Date (mm/dd/yy): \_\_\_\_\_

Recorder: \_\_\_\_\_

Page: \_\_\_\_\_ of \_\_\_\_\_

Survey Code: \_\_\_\_\_

|    | SPN | STATION<br>NUMBER | BUOY ID | SPECIES<br>CODE | SEX | LEGAL<br>SIZE | FEMALE<br>MATURITY | SPECIAL<br>CATEGORY | NUMBER<br>NOT<br>MEASURED | NUMBER<br>MEASURED | TOTAL<br>NUMBER | COMMENTS |
|----|-----|-------------------|---------|-----------------|-----|---------------|--------------------|---------------------|---------------------------|--------------------|-----------------|----------|
| 1  |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 2  |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 3  |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 4  |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 5  |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 6  |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 7  |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 8  |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 9  |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 10 |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 11 |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 12 |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 13 |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 14 |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |
| 15 |     |                   |         |                 |     |               |                    |                     |                           |                    |                 |          |

**SPECIES CODES:**  
 1 = golden king  
 2 = red king  
 3 = blue king  
 4 = hair crab  
 5 = hybrid, *C. bairdi* x *C. opilio*  
 6 = *C. bairdi*  
 7 = *C. opilio*  
 8 = *C. angulatus*  
 9 = Dungeness  
 10 = *L. couesi*  
 11 = *G. jarrovi*  
 12 = *P. multispina*  
 13 = *P. ventri*  
 41 = hybrid, *C. bairdi*  
 42 = hybrid, *C. opilio*

**SEX:**  
 0 = unknown  
 1 = male  
 2 = female  
 3 = hermaphrodite

**LEGAL SIZE:**  
 blank = sublegal  
 1 = legal, retained  
 2 = legal, not retained

**FEMALE MATURITY:**  
 0 = unknown  
 1 = immature  
 2 = mature  
 3 = mature - primiparous  
 4 = mature - multiparous

**SPECIAL CATEGORIES**  
 1 = legal males ≥ 150 mm CL  
 2 = legal males, new shell < 150 mm CL  
 3 = sublegal males ≥ 120 mm CL  
 4 = sublegal males < 120 mm CL  
 5 = mature females (eggs or matted setae)  
 6 = immature females (clean setae)



### INSTRUCTIONS FOR CRAB SUBSAMPLING FORM

This form is used to record the total number of crabs that have been subsampled at each pot by separate sex and size categories determined prior to conducting the survey. Measuring of crabs will not commence until crab counts for each subsampling category have been made and recorded.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, Station Number, Buoy ID fields, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form. Record the Species Code, Sex, and Female Maturity columns as directed in the *Crab Measurement Form* instructions.

Special Category: Enter one of the six special category codes in the row containing the appropriate SPN and station number. The six special categories that will be used during the 2008 Pribilof District king crab survey are:

- 1 = legal males  $\geq 150$  mm CL
- 2 = legal males, new shell  $< 150$  mm CL
- 3 = sublegal males  $\geq 120$  mm CL
- 4 = sublegal males  $< 120$  mm CL
- 5 = mature females (eggs or matted setae)
- 6 = immature females (clean setae)

**Number Not Measured (i.e., crabs counted and released to the sea):** Tally the number of unmeasured crabs by identified sex and size categories.

**Number Measured (i.e., subsample of crabs that were measured):** Tally the number of crabs measured by identified sex and size categories.

**Total Number:** Add the number of measured and unmeasured crabs and record the total number of crabs caught by identified sex and size categories.

**Comments:** Anything related to the sampling or subsampling of sex and size categories will be noted.

---

Appendix C5.-Fish length form.

**Fish Length Form**

Sample Date (mm/dd/yy) : \_\_\_\_\_

Vessel Name: \_\_\_\_\_

Survey Code: \_\_\_\_\_

Recorder: \_\_\_\_\_

Page # \_\_\_\_\_ of \_\_\_\_\_

Measurer(s): \_\_\_\_\_

|    | SPN | SPECIES CODE | FISH LENGTH (mm) | SPECIES NAME | COMMENTS |
|----|-----|--------------|------------------|--------------|----------|
| 1  |     |              |                  |              |          |
| 2  |     |              |                  |              |          |
| 3  |     |              |                  |              |          |
| 4  |     |              |                  |              |          |
| 5  |     |              |                  |              |          |
| 6  |     |              |                  |              |          |
| 7  |     |              |                  |              |          |
| 8  |     |              |                  |              |          |
| 9  |     |              |                  |              |          |
| 10 |     |              |                  |              |          |
| 11 |     |              |                  |              |          |
| 12 |     |              |                  |              |          |
| 13 |     |              |                  |              |          |
| 14 |     |              |                  |              |          |
| 15 |     |              |                  |              |          |
| 16 |     |              |                  |              |          |
| 17 |     |              |                  |              |          |
| 18 |     |              |                  |              |          |
| 19 |     |              |                  |              |          |
| 20 |     |              |                  |              |          |
| 21 |     |              |                  |              |          |
| 22 |     |              |                  |              |          |
| 23 |     |              |                  |              |          |
| 24 |     |              |                  |              |          |
| 25 |     |              |                  |              |          |

**FISH TO MEASURE**

10285 = Alaska plaice  
10110 = arrowtooth flounder  
21921 = Atka mackerel  
30330 = black rockfish  
30400 = bocaccio  
10270 = butter sole  
30151 = dark rockfish  
30152 = dusky rockfish  
10170 = English sole

10130 = flathead sole  
10115 = greenland turbot  
10112 = Kamchatka founder  
21910 = lingcod  
30420 = northern rockfish  
10261 = northern rock sole  
21720 = Pacific cod  
10120 = Pacific halibut  
21110 = Pacific herring

30060 = Pacific ocean perch  
21710 = Pacific tomcod  
30475 = redbanded rockfish  
30430 = redstripe rockfish  
10200 = rex sole  
30050 = rougheye rockfish  
20510 = sable fish  
10250 = sand sole  
30560 = sharpchin rockfish

30020 = shortspine thornyhead  
10262 = southern rock sole  
10220 = starry flounder  
21740 = walleye Pollock  
30470 = yelloweye rockfish  
10210 = yellowfin sole

-continued-

### INSTRUCTIONS FOR FISH LENGTH FORM

This form is used to record the measurements of commercially-important or other selected fish species from sampled pots. If there are no fish species measured from the pot, make a null symbol ‘Ø’ in the Species Name column for that SPN.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the data recorder’s name and the name(s) of those who measured the fish.

**Species Code:** Record the 5-digit NMFS RACE code of each measured fish. Fish species to be measured are listed and coded at the bottom of the form; refer to the supplied 2007 NMFS Species Code Book for additional codes.

**Fish Length (cm):** Record the total length or the fork length of the fish, in centimeters.

Fork length (FL) – Distance from the anteriormost point on the head to the innermost part of the fork of the tail fin.

Total length (TL) – the greatest length of a fish from the anteriormost point on the head to the tip of the tail.

**Species Name:** Write the common name, or if unavailable, the scientific name of each animal caught.

**Comments:** Anything related to the individual fish measured. If the fish was preserved or collected for identification, document that action in the Comments section.

---

**QTC VIEW Form**

| Date | Time | Comments |
|------|------|----------|
|      |      |          |
|      |      |          |
|      |      |          |
|      |      |          |
|      |      |          |
|      |      |          |
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|      |      |          |
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|      |      |          |
|      |      |          |
|      |      |          |
|      |      |          |
|      |      |          |
|      |      |          |
|      |      |          |

**INSTRUCTIONS FOR QTC VIEW FORM**

This form is used to keep track of the data files created by the QTC VIEW. The primary purpose of form is to note any problems, ocean or weather conditions that may affect the quality of the data acquired.

**Date and Time:** record the current day and time the file is downloaded to the external hard drive.

**File Name:** record the year, month and day (yyyymmdd) corresponding to the particular data set being downloaded. The QTC VIEW automatically assigns this format to the data.

**Comments:** enter any relevant observations here.

---

## Appendix C7.–Benthic sampling form.

### Benthic Sample Form

Vessel Name: \_\_\_\_\_

Survey Code: \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_

|    | Sample Number | Sample Date<br>(mm/dd/yy) | Time<br>(0000-2359) | Location                   |                              |        | Depth<br>(fathoms) | Comments |
|----|---------------|---------------------------|---------------------|----------------------------|------------------------------|--------|--------------------|----------|
|    |               |                           |                     | Latitude (N)<br>(dd°mm.mm) | Longitude (W)<br>(ddd°mm.mm) | E or W |                    |          |
| 1  |               |                           |                     |                            |                              |        |                    |          |
| 2  |               |                           |                     |                            |                              |        |                    |          |
| 3  |               |                           |                     |                            |                              |        |                    |          |
| 4  |               |                           |                     |                            |                              |        |                    |          |
| 5  |               |                           |                     |                            |                              |        |                    |          |
| 6  |               |                           |                     |                            |                              |        |                    |          |
| 7  |               |                           |                     |                            |                              |        |                    |          |
| 8  |               |                           |                     |                            |                              |        |                    |          |
| 9  |               |                           |                     |                            |                              |        |                    |          |
| 10 |               |                           |                     |                            |                              |        |                    |          |
| 11 |               |                           |                     |                            |                              |        |                    |          |
| 12 |               |                           |                     |                            |                              |        |                    |          |
| 13 |               |                           |                     |                            |                              |        |                    |          |
| 14 |               |                           |                     |                            |                              |        |                    |          |
| 15 |               |                           |                     |                            |                              |        |                    |          |
| 16 |               |                           |                     |                            |                              |        |                    |          |
| 17 |               |                           |                     |                            |                              |        |                    |          |
| 18 |               |                           |                     |                            |                              |        |                    |          |
| 19 |               |                           |                     |                            |                              |        |                    |          |
| 20 |               |                           |                     |                            |                              |        |                    |          |

ADF&G SHELLFISH RESEARCH-REV JUNE 11, 2007

### INSTRUCTIONS FOR BENTHIC SAMPLE FORM

This form is used to document benthic samples collected during the charter. Complete the form at the time the sample is taken. Enter the Vessel Name, Survey Code, Sample Date and Time, Location, and Depth as directed in the *Survey Pilot House Log* instructions. At the start of sample collection, ask the captain for the latitude and longitude coordinates (either he writes them down or he hails them to the deck) and depth. Sample Numbers will be unique and numbered sequentially beginning at '1'.

In the Comments section, note information pertinent to the collected sample such as current, tide, and weather conditions that may have hampered sample collection. Performance of the Van Veen grab during deployment and retrieval of the unit must also be detailed in the Comments section, including whether or not the grab landed properly and whether or not the grab was completely closed at retrieval.

## Appendix C8.—Weather observation form.

### Weather Observation Form

Vessel Name: \_\_\_\_\_ Survey Code: \_\_\_\_\_ Page \_\_\_\_\_ of \_\_\_\_\_

| STATION<br>NUMBER | DATE<br>(mm/dd/yy) | TIME<br>(0000-2359) | CLOUD<br>COVER | WIND  |           | SWELL | BAROMETER<br>(millibars) | COMMENTS |
|-------------------|--------------------|---------------------|----------------|-------|-----------|-------|--------------------------|----------|
|                   |                    |                     |                | SPEED | DIRECTION |       |                          |          |
| 1                 |                    |                     |                |       |           |       |                          |          |
| 2                 |                    |                     |                |       |           |       |                          |          |
| 3                 |                    |                     |                |       |           |       |                          |          |
| 4                 |                    |                     |                |       |           |       |                          |          |
| 5                 |                    |                     |                |       |           |       |                          |          |
| 6                 |                    |                     |                |       |           |       |                          |          |
| 7                 |                    |                     |                |       |           |       |                          |          |
| 8                 |                    |                     |                |       |           |       |                          |          |
| 9                 |                    |                     |                |       |           |       |                          |          |
| 10                |                    |                     |                |       |           |       |                          |          |
| 11                |                    |                     |                |       |           |       |                          |          |
| 12                |                    |                     |                |       |           |       |                          |          |
| 13                |                    |                     |                |       |           |       |                          |          |
| 14                |                    |                     |                |       |           |       |                          |          |
| 15                |                    |                     |                |       |           |       |                          |          |
| 16                |                    |                     |                |       |           |       |                          |          |
| 17                |                    |                     |                |       |           |       |                          |          |
| 18                |                    |                     |                |       |           |       |                          |          |
| 19                |                    |                     |                |       |           |       |                          |          |
| 20                |                    |                     |                |       |           |       |                          |          |
| 21                |                    |                     |                |       |           |       |                          |          |
| 22                |                    |                     |                |       |           |       |                          |          |
| 23                |                    |                     |                |       |           |       |                          |          |
| 24                |                    |                     |                |       |           |       |                          |          |
| 25                |                    |                     |                |       |           |       |                          |          |

**CLOUD COVER:**  
 1 = Clear  
 2 = 1/8 obscured  
 3 = 1/4 obscured  
 4 = 3/8 obscured  
 5 = 1/2 obscured  
 6 = 5/8 obscured  
 7 = 3/4 obscured  
 8 = 7/8 obscured  
 9 = Completely overcast

**WIND SPEED:**  
 0 = Calm  
 1 = Light air  
 2 = Light breeze  
 3 = Gentle breeze  
 4 = Moderate breeze  
 5 = Fresh breeze  
 6 = Strong breeze  
 7 = Near gale  
 8 = Gale  
 9 = Strong (or severe) gale  
 10 = Storm  
 11 = Violent storm  
 12 = Hurricane

**SWELL:**  
 1 = 0 .. 2 feet  
 2 = 2 .. 4 feet  
 3 = 4 .. 6 feet  
 4 = 6 .. 8 feet  
 5 = 8 .. 10 feet  
 6 = 10 .. 12 feet  
 7 = 12 .. 14 feet  
 8 = 14 .. 16 feet  
 9 = more than 16 feet

ADF&G SHELLFISH RESEARCH-Rev. June 11, 2007

### INSTRUCTIONS FOR WEATHER OBSERVATION FORM

This form is used to document daily weather observations at stations fished during the charter, and will be completed at the time each station is set and picked (2 observations per station). If an observation is made at non-station locations, leave the station number blank.

Enter the Vessel Name, Survey Code, Page Number, Station Number, Date, and Time as directed in the *Survey Pilot House Log* instructions. Record the appropriate **code** numbers for cloud cover, wind speed (see next page for wind speed code explanations) and direction, swell, and barometer reading. In the Comments section, note any other information pertinent to the weather observation.

-continued-

## Wind Speed Codes

Wind speed is a measure of wind velocity in knots and uses the Beaufort scale.

**0 = Calm:** Sea surface smooth and mirror-like. Wind speed approximately 0-1 knots (0-1 mph).

**1 = Light Air:** Ripples with the appearance of scales are formed, but without foam crests. Wind speed approximately 1-3 knots (1-3 mph).

**2 = Light Breeze:** Small wavelets, still short, but more pronounced. Crests have a glassy appearance and do not break. Wind speed approximately 4-6 knots (4-7 mph).

**3 = Gentle Breeze:** Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses. Wind speed approximately 7-10 knots (8-12 mph).

**4 = Moderate Breeze:** Small (1-4 ft) waves becoming larger; fairly frequent white horses. Wind speed approximately 11-16 knots (13-18 mph).

**5 = Fresh Breeze:** Moderate (4-8 ft) waves taking a more pronounced long form; many white horses are formed. Chance of some spray. Wind speed approximately 17-21 knots (19-24 mph).

**6 = Strong Breeze:** Large (8-13 ft) waves begin to form; the white foam crests are more extensive everywhere. Probably some spray. Wind speed approximately 22-27 knots (25-31 mph).

**7 = Near Gale:** Moderately high (13-20 ft) waves and white foam from breaking waves begins to be blown in streaks along the direction of the wind. Wind speed approximately 28-33 knots (32-38 mph).

**8 = Gale:** Moderately high (13-20 ft) waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind. Wind speed approximately 34-40 knots (39-46 mph).

**9 = Strong (or Severe) Gale:** High (20 ft) waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility. Wind speed approximately 41-47 knots (57-54 mph).

**10 = Storm:** Very high (20-30 ft) waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea takes on a white appearance. The 'tumbling' of the sea becomes heavy and shock-like. Visibility affected. Wind speed approximately 48-55 knots (55-63 mph).

**11 = Violent Storm:** Exceptionally high (30-45 ft) waves (small and medium-size ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected. Wind speed approximately 56-63 knots (64-72 mph).

**12 = Hurricane:** The air is filled with foam and spray, waves over 45 ft. Sea completely white with driving spray; visibility very seriously affected. Wind speed approximately 64-71 knots (73-83 mph).

**Appendix C9.**–Email / radio log.

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| 2008 PRIBILOF DISTRICT RED AND BLUE KING CRAB SURVEY  |               |                              |                |                                |                                 |
|---|---------------|------------------------------|----------------|--------------------------------|---------------------------------|
| EMAIL: <a href="mailto:doug.pengilly@alaska.gov">doug.pengilly@alaska.gov</a> or <a href="mailto:patricia.conley@alaska.gov">patricia.conley@alaska.gov</a> |               |                              |                |                                |                                 |
| DAILY RADIO CALL TIME: <b>10:00hrs (or 14:30hrs if not successful)</b>  |               |                              |                |                                |                                 |
| USE SSB RADIO FREQUENCY <b>4125 (4A) or 4146 (4B)</b>   |               |                              |                |                                |                                 |
| Report Date   | Activity Date | Station # or Niche String #) | Number of Pots | Number of Legal Red King Crabs | Total Number of Blue King Crabs |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |
|   |               |                              |                |                                |                                 |

Report Date: day report is sent to office

Activity Date: day the pots are lifted

Station # or Niche String #: station numbers are predetermined, niche strings start at 1

Number of Pots: number of pots lifted at station (usually 4) or in a string (variable)

Number of Crabs: self explanatory

---



### Data Logger Recording Form

Survey Dates: \_\_\_\_\_

Vessel Name: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_

Survey Code \_\_\_\_\_

Recorder: \_\_\_\_\_

| Deck ID | Model      | Maximum Depth in Fathoms | Serial Number | Comments |
|---------|------------|--------------------------|---------------|----------|
| 219     | XR-420-CTD | 2,185                    | 9643          |          |
| 221     | XR-420-CTD | 2,185                    | 9616          |          |
| 222     | TDR-2050   | 3,280                    | 11879         |          |
| 223     | TDR-2050   | 3,280                    | 11880         |          |
| 224     | TDR-2050   | 3,280                    | 11818         |          |
| 225     | TDR-2050   | 3,280                    | 11808         |          |
| 226     | TR-1050    | 400                      | 12570         |          |
| 227     | TR-1050    | 400                      | 12569         |          |
| 228     | TR-1050    | 400                      | 12176         |          |
| 229     | TDR-2050   | 3,280                    | 11884         |          |
| 230     | TDR-2050   | 3,280                    | 11885         |          |
| 231     | TDR-2050   | 3,280                    | 11886         |          |
| 232     | XR-420-CTD | 3,280                    | 13166         |          |
| 233     | XR-420-CTD | 3,280                    | 13167         |          |
| 234     | XR-420-CTD | 3,280                    | 13168         |          |
| 235     | TR-1000    | 545                      | 7209          |          |
| 236     | TR-1000    | 545                      | 8429          |          |
| 237     | XR-420-CTD | 3,280                    | 13234         |          |
| 238     | XR-420-CTD | 3,280                    | 13235         |          |
| 239     | TR-1000    | 545                      | 8816          |          |
|         |            |                          |               |          |
|         |            |                          |               |          |

#### INSTRUCTIONS FOR DATA LOGGER FORM

This form is used to identify the unique logger ID number of the units that are deployed in survey pots. Enter the Sample Date, i.e., the date that the form was filled out and the Vessel Name and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form. If additional loggers are used, record all items as detailed above.

**Comments:** Anything related to the performance, deployment, and especially ‘not retrieved’ if a pot containing a logger is lost during the survey.

---



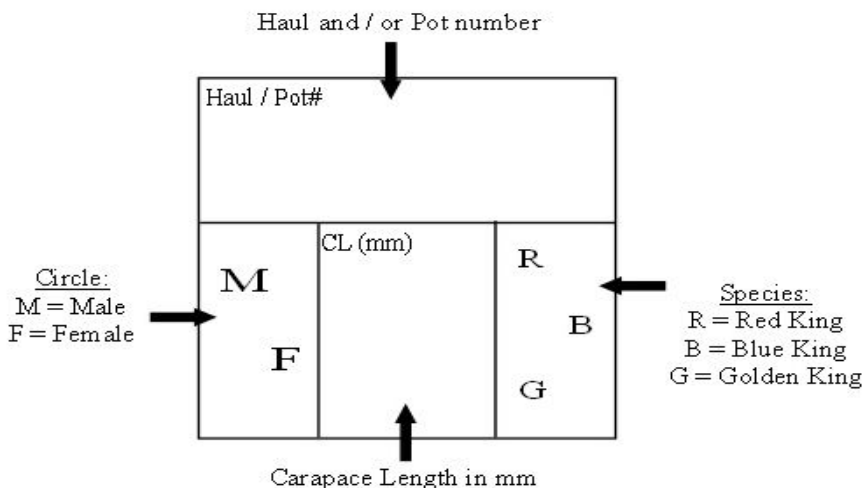
## **APPENDIX D. ANCILLARY DATA COLLECTIONS**

## 2008: KING CRAB SAMPLING PROTOCOL FOR THE PRIBS

Nonlethal hemolymph collection from red king crabs. We would like blood samples placed in ethanol from **sexually mature male & female king crabs** for baseline population genetics research. Crustacean blood cells are nucleated and contain DNA; whole blood can be used in place of traditional tissues (skeletal muscle, heart, etc) for extraction and recovery of DNA. Frequently limbs are removed from crustaceans and preserved for DNA work. Unfortunately limb removal can result in death of the animal from blood loss, entry of pathogens, etc. Blood draws are less invasive than the traditional removal of a limb because bleeding from the wound and the magnitude of the wound itself are much reduced over that from a limb removal. Additionally the animal does not suffer the loss of a needed appendage.

### Sample collection in ethanol:

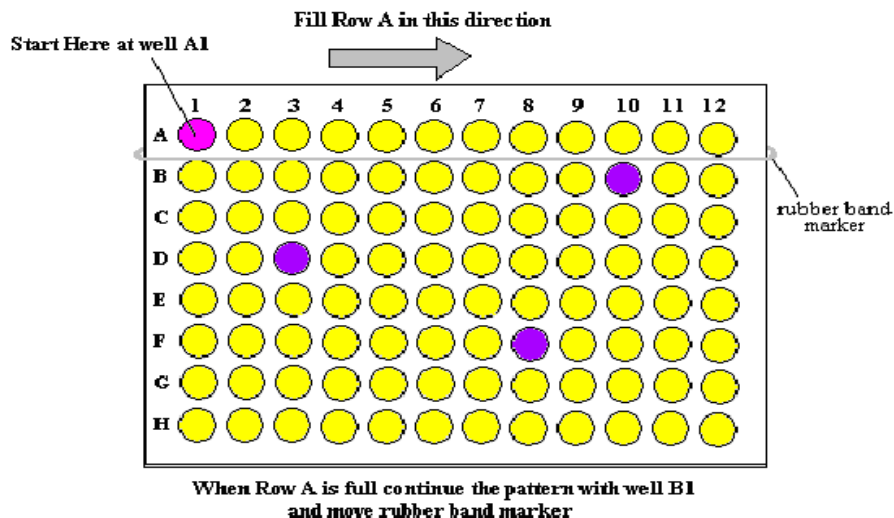
1. For crabs sampled in the field: On sample sheet, record cruise number, cruise leg, vessel, general location (i.e. Norton Sound), plate number (from side of plate), and your name. Record data for each crab on datasheets provided. Note species, carapace length (CL, in mm to the 0.1 mm) and sex of crab; record haul, pot or station # (whichever allows retrieval of location data for the crab). Use the datasheets provided, and follow the two diagrams below.
2. For crabs sampled in the lab: If you have the cruise info (as above), you can record that, but it may be easier to record the lat & long of the collection site for the crabs. To record lat & long, on the back side of the data sheet; use the well position to as the identifier for ea sample. Example: for blood sample in well A1, on back side note A1: 56°37.20'N 162°04.78'W. If you already have the lat/long in a table, you can attach the table to the data sheet and record the crab # (plate position) in the table.



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-continued-

3. Obtain a clean syringe with attached needle. Choose a region of the crab where the arthroal membrane is exposed and insert the needle (a good spot is where the legs meet the carapace). Pull back on the plunger to extract hemolymph, you may need to move the needle around to locate a sinus. Collect approximately 0.2 ml hemolymph. If the hemolymph is brownish/yellow or green, you have sucked up hepatopancreas with the blood and the sample must be discarded. Obtain a new syringe and try again.
4. If there is air in the syringe, hold the syringe with the needle pointed up and finger-flick the syringe until the blood has collected at the plunger. Gently push the plunger to expel the air and bring the blood up to the needle. If you don't remove the excess air from the syringe, you run the risk of either injecting air into the well and popping off the cap (put cap back on and note on back of data sheet), or injecting too much blood into the well (the compressed air in the syringe will push blood out as it expands).
5. Insert the needle into the colored well plug and slowly eject **0.2 ml** of the hemolymph into the EtOH. If you eject more than 0.2 ml of blood the ethanol will be too dilute to properly preserve the sample. Pull out the needle (the well plug will reseal itself). If you find that the plug is loose or comes out, make sure you are not injecting air into the well.
6. Remove needle from the syringe using the needle remover on the sharps container: trap the plastic part of the needle in the V and twist off the syringe.
7. When adding blood to the wells, follow the picture below and insure that each blood sample corresponds to the crab it came from as recorded on the datasheet (e.g., blood from crab A1 on data sheet is in well A1 on plate). Start with the well marked **A1** (grey cap) then proceed across the **A** row to A2, A3 etc. When row A is full move to well **B1** and continue filling **row B** etc. Use this pattern for all plates. When a row is complete move the rubber band to the next row to help you keep track of where you are on the plate. If it helps, mark the top of the plug with a Sharpie to show that the well has been filled, preferably on the edge of the plug. If you have any problems, comments, mistakes, etc., note the well number and any information on the back of the datasheet. Do not put blood in wells B10, D3, or F8 – these are reserved for DNA controls (You can practice with a syringe by adding water to the 3 control wells if you like – please note on the backside of the data sheet if you add anything to the control wells.)
8. Periodically invert the plate to mix the hemolymph and EtOH.
9. When a plate is full, replace in Ziploc bag and seal.



-continued-

For any questions, contact Pam Jensen , [Pam.Jensen@noaa.gov](mailto:Pam.Jensen@noaa.gov), 206 526-4122 or Christie Shavey, [Christie.Shavey@noaa.gov](mailto:Christie.Shavey@noaa.gov), 206 526-6715. These samples will eventually be sent to Dave Tallmon [david.tallmon@uas.alaska.edu](mailto:david.tallmon@uas.alaska.edu) at UAS, 907-796-6330. Please hold on to the plates until Dave asks for them in case you get an opportunity to sample additional crabs for us.



Thank you.

---

## Special Project, ADFG Survey September 2008

**Project:** Ovary and Stomach Collection of yellow Irish lord (*Hemilepidotus jordani*), bigmouth sculpin (*Hemitripterus bolini*), and great sculpin (*Myoxocephalus polyacanthocephalus*) females.

**Point of Contact:** Todd TenBrink, Research Fisheries Biologist

**Affiliation:** Alaska Fisheries Science Center, Resource Ecology and Fisheries Management Division, Resource Ecology and Ecosystem Modeling Program

**Address:** 7600 Sand Point Way NE, Seattle WA 98115

**Email:** Todd TenBrink – [Todd.TenBrink@noaa.gov](mailto:Todd.TenBrink@noaa.gov)      **Phone:** 206-526-4697 (w)

### General Description and Justification

Impacts of fishing on large sculpin species and their ecological role in the eastern Bering Sea and Aleutian Islands are relatively unknown due to a lack of various data including basic life history and demographic information. This project request will partly fulfill a broader sculpin study by examining the life history of three large sculpin species in the Aleutian Islands: great sculpin, *Myoxocephalus polyacanthocephalus*, bigmouth sculpin, *Hemitripterus bolini*; and the yellow Irish lord, *Hemilepidotus jordani*.

### Collection protocol:

**This project request will concentrate on females only.** Collect samples from each centimeter range of fork length from the following species:

|               |                                    |                      |
|---------------|------------------------------------|----------------------|
| Great sculpin | 45-80cm (max. of 3 females/per cm) | TARGET: 40 specimens |
|---------------|------------------------------------|----------------------|

|                  |                                    |                      |
|------------------|------------------------------------|----------------------|
| Bigmouth sculpin | 45-80cm (max. of 3 females/per cm) | TARGET: 40 specimens |
|------------------|------------------------------------|----------------------|

**(ovaries only)**

|                   |                                    |  |
|-------------------|------------------------------------|--|
| Yellow Irish lord | 30-50cm (max. of 5 females/per cm) | TARGET: 50 specimens <b>(ovaries and stomachs)</b> |
|-------------------|------------------------------------|--|

To allocate the sample collections over each length range, tally each species collections separately on plastic length measurement strips. For each specimen collected record the haul number, vessel, species name, fork length, total weight, and unique consecutive specimen identification number on the specimen form label. **The label provided can be used for both ovaries and stomachs.** It is understandable if not all tissues are collected from the same specimen because of time constraints, etc. Also, record the fresh

ovary weight (from a minimum random sample of up to 15) for each species on the specimen form and label. This information will be helpful in reporting GSI values. It is likely that ovaries of the yellow Irish lord will be spent, but developing in the other species. Place the completed label in a cloth bag, remove the ovaries and place them in the bag, draw the string tight and loop once (don't knot) (Note: it is OK if some eggs are lost when removing the ovary). Place stomach in a separate cloth bag with a separate label. Submerge the bags in a bucket half full of 10% formalin. Use a cut lid with a used bucket. A bucket should be replaced with a new bucket once the bags and formalin reach 2-3 inches from the inside top. Seal a full bucket with an uncut lid by pounding the top of the lid over the bucket.

To make the 10% formalin mixture: Don appropriate Personal Protective Equipment (rain gear, gloves, and goggles/face shield). Fill a 5 gallon DOT approved bucket half full with sea water (or fresh water), add 1/8 cup baking soda (buffer), add 1 liter of 37% formaldehyde (100% formalin). Place the lid on the bucket and gently agitate to mix. Label each bucket: Sculpin Special Project, Attn: Todd TenBrink, NOAA/NMFS/AFSC, Seattle, WA. Place the provided NFPA hazardous materials label on each bucket.

**List of supplies:** DOT buckets and lids, formaldehyde, NFPA labels, baking soda, 1/8 cup measurement, cloth bags, labels, sharpies, specimen data sheets, plastic length measurement strips as temporary tally sheets, otolith vials. Hazardous material: 37% formaldehyde in 1L bottles (100% formalin). All supplies will be available from the NMFS Dutch Harbor field office prior to the survey. This handover will be coordinated by Todd TenBrink.

**SHIPPING Contact:** Todd TenBrink 24/7 at 425-379-9344 (H); 425-770-4248 (Cell); 206-526-4697 (W)

At the conclusion of the survey, full, sealed buckets will be stored at the NMFS Dutch Harbor office. **ADFG will not be responsible for shipping buckets.**

**Permits issued or pending:** No special permits are required for this project.

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## **APPENDIX E. EQUIPMENT LIST**

**Personal Equipment**

Immersion suit with new 406 EPIRB and FireFly3 strobe  
Rain gear, boots, gloves (6 pairs liners and 6 pairs rubber per person)  
SOSpenders (approved Type V for use as a Type II)  
LED headlamps

**Deck and Sampling Equipment**

aluminum sorting table, 4'x8' with 6 detachable legs, 3" hex head nuts and bolts  
covered clipboards, aluminum or plastic (5), regular clipboards (4)  
calipers, large size with millimeter scale (6)  
measuring sticks: 6.5" for king crab (4), 5.5" for Tanner crabs (3), 3.25" for hair crab (3)  
tape measures (cm) for fish measurements (3)  
onion sacks for holding crabs, fish in tanks (6)  
fish measuring board (1)  
can WD-40 (3)  
dump totes (4)  
fish baskets (25)  
plastic Rubbermaid dishpans (4)  
assorted plastic bags: (2 doz.) gallon and (100) quart zip-locks; (2 doz.) 25 gal. clear thick mil  
rolls electric tape (10)  
liter of 100% formalin, with mixing jar (1)  
alcohol – one (1) gallon  
specimen jars (20)  
dissecting kit (1)  
Victorinox knives (12)  
plastic toolbox for crab sampling equipment (2)  
magnifying light (1)  
magnifying lens (2), including (1) 4-inch diameter  
Van Veen grab sampler (1)  
safety mats, to stand on while sampling

**Fishing Pot Supplies**

5-lb rolls #30 biodegradable cotton twine (2)  
5-lb rolls #96 tarred seine twine (7)  
5-lb rolls #84 tarred seine twine (5)  
5-lb rolls 5-mm orange poly twine (12)  
600-ft roll #32 groundline, for door ties (1)  
door hooks (50)  
door rubbers (50)  
net mending needles (4), assorted sizes  
hand-held propane torches (2)  
propane cylinders (2)

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### **Forms**

Survey Pilot House Log sheets (60)  
Crab Measurement Forms (4,000 - rite-in-rain) \*\*check on use of old forms\*\*  
Station Catch Summary Forms (80)  
Crab Subsampling Forms (100, rite-in-rain) \*\*check on use of old forms\*\*  
Species Composition Forms (400, rite-in-rain) \*\*check on use of old forms\*\*  
Fish Length Forms (250, rite-in-rain) \*\*check on use of old forms\*\*  
Temperature Logger ID Forms (2, rite-in-rain )  
QTC VIEW Forms (10)  
Benthic Sampling Forms (10, rite-in-rain)  
Weather Observation Forms (25)  
specimen labels sheets (10, rite-in-rain)

### **Charts and Books**

NOAA Chart 16830 – Pribilof Islands  
2007 NMFS Species Codebook  
2006/2008 Commercial Shellfish Fishing Regulations  
Checklist of Alaskan Crabs, B.G. Stevens 2002  
Biological Field Techniques for Chionoecetes Crabs, Jadamec et al. 1999  
Biological Field Techniques for Lithodid Crabs, Donaldson and Byersdorfer 2005  
Alaska Saltwater Fishes and Other Sea Life, Kessler 1985  
Guide to the Identification of some common eastern Bering Sea Snails, MacIntosh 1976  
Common fish and inverts near Pribilof Islands - Byersdorfer 2004  
Field Guide to the Benthic Marine Invertebrates of Alaska's shelf and upper slope, Roger N. Clark, 2006 version, CD only  
Names of Decapod Crustaceans AFS #17, Williams et al. 1989  
Names of Mollusks AFS #16, Turgeon et al. 1988  
Pacific Coast Fishes, Eschmeyer and Heard  
Fishes of Alaska, Mecklenburg et al. 2002  
Guide to northeast Pacific Flatfishes, Kramer et al. 1995  
Guide to northeast Pacific Rockfishes - 2003 edition, Kramer & O'Connell 1986  
A Field Guide to Alaskan Corals, Wing and Barnard 2004  
Guide to Marine Mammals of Alaska, Wynne Third Edition, 2007  
Field Guide to Sharks, Skates and Ratfish of Alaska, Stevenson, et al., 2007  
Under Alaskan Seas, Barr and Barr 1983  
A Field Guide to the Birds of North America, National Geographic – 4<sup>th</sup> edition 2002  
Laminated color chart, ADF&G Shellfish Research 2006  
Pacific Coast Crabs and Shrimps, Jensen 1995

### **Office and Miscellaneous Supplies**

Rite in Rain notebooks (5)  
Rite in Rain paper (500 sheets)  
small 3-ring binder for completed Pilot House Log forms (1)  
small 3-ring binder for completed Station Catch Summary forms (1)

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**Office and Miscellaneous Supplies (con't)**

calculators (2)  
 mechanical pencils (20)  
 No. 2 regular pencils (2 boxes)  
 ink pens (5)  
 permanent markers (3)  
 sheets plain paper (100)  
 pairs earplugs (20)  
 3-ring hole punch (1)  
 assorted. rubber bands (including large, for clipboards)  
 assorted rubber bands (including large, for clipboards)  
 roll Scotch tape (1); rolls duct tape (2)  
 assorted. paper and binder clips  
 envelopes - data form filing (15)  
 North Star medical kit (inventoried and resupplied 6/30/2007)  
 25-ft extension cord (1)

**Computers**

laptop, with case (2)  
 power cord (2)  
 mouse and mouse pad, if desired (2)  
 external keyboard, if desired (2)  
 Burnable CD-R (6)  
 Buss bar (2)

**Cameras**

Video recorder and “pumpkin” camera  
 Olympus E-10 (digital)  
 batteries and charger for both cameras  
 memory cards

**Data Loggers and Accessories**

Loggers:

| <u>Conductivity/Temp/Depth</u> |       | <u>Temperature/Depth</u> |       | <u>Temperature</u> |       |
|--------------------------------|-------|--------------------------|-------|--------------------|-------|
| XR-420-CTD                     | 9616  | TDR-2050                 | 11808 | TR-1050            | 12176 |
| XR-420-CTD                     | 9643  | TDR-2050                 | 11818 | TR-1050            | 12569 |
| XR-420-CTD                     | 13166 | TDR-2050                 | 11879 | TR-1050            | 12570 |
| XR-420-CTD                     | 13167 | TDR-2050                 | 11880 |                    |       |
| XR-420-CTD                     | 13168 | TDR-2050                 | 11884 | TR-1000            | 7209  |
| XR-420-CTD                     | 13234 | TDR-2050                 | 11885 | TR-1000            | 8429  |
| XR-420-CTD                     | 13235 | TDR-2050                 | 11886 | TR-1000            | 8816  |

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**Data Loggers and Accessories (con't)**

Accessories:

RBR Submersible Data Logger User's Manual – 1/2006 edition

RBR software CD version 5.21, RS232 cable, and maintenance kit (lube, 'O'-rings

Hydraulic hose sleeves and steel attachment hardware (shackles, bolts, carabineers)

door hooks and rubbers for securing probes inside pots

3-volt batteries; XR-420-CTDs require X; TDR-2050/2051 require X

**QTC Equipment**

QTC VIEW hardware, the 'blue box', with cable for attachment to the ship's echo sounder

QTC IMPACT software

Dedicated laptop for software installation and daily downloads from the blue box

digital global positioning system (DGPS) with wide area augmentation system (WASS)

ship's echo sounder retrofitted by Harris Electric with cable from the blue box

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## **APPENDIX F. MANAGING QTC DATA AT SEA**

### **Generation of QTC data files**

Each time data acquisition is started, or an automatic file break occurs (every 2 hours), a new data directory is automatically created in the base directory by the QTC software. The directory names are derived from the date and time at which acquisition was started. The format for the directory name is D:\qtc\raw\qtc4\yyyymmdd\hhmmss.

For example, the data in the directory D:\qtc\raw\qtc4\20040217\101332 were created at 10:13:32 in the morning on Feb. 17, 2004.

There are several data files created in each data directory. The names and functions of each file are as follows:

1. `qtc4_raw`: Contains the amplitude time series for each trace acquired during logging. This is the primary data file that is imported into QTC IMPACT and used for bottom classification.
2. `gps_raw`: Contains the GPS NMEA strings acquired during logging. All NMEA strings are recorded, not just those used for parsing the navigation and time.
3. `acquisition.log`: This is a running status file used to record various real-time values generated during acquisition. The data in this file are used for debugging by QTC engineers and may also be used by operators in post processing to recall items of meta-data that are not recorded in the `qtc4_raw` file.

### **Survey laptop memory space**

The memory space on the D: drive of the survey laptop computer is limited and therefore the data generated by QTC must be moved to the external hard drive every couple of days or so. If the D: drive gets too full, the drive will simply stop recording data.

Moving the data from the D: drive to the external hard drive:

1. Set up a folder on the external hard drive to receive the daily QTC data folders. Name this folder `QTCDDataFromSurvey` (for example, `QTCDDataFromStMatts2007`).
2. Copy the data folder that QTC created for the day on the D: drive into the survey folder on the external hard drive.
3. After verifying the data was successfully copied, delete that days data from the survey laptop D: drive.

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### **Creating backups of the data**

Creating backups of the QTC data must also be done 2 or 3 times during a survey to ensure data is not lost in the event of a computer meltdown or something going wrong with the vessels electrical system. The safest and most effective way to create independent backups of this data on the external hard drive is to burn it to CD's or DVD's.

- Typically, an entire surveys worth of zipped QTC data will fit on 3 CD's, or, 1 DVD.

To do this:

1. It is necessary to zip the data files in order to get the as much of the QTC data onto a CD as possible. Within the folder created above by moving the data from the D: drive to the external hard drive, select the data folder you want to zip, right click on it and move down to the ZipGenius option and select the "Create yyyyymmdd.zip".
2. A normal, 700mb recordable CD can hold about 10 to 12 days worth of zipped QTC data. Therefore, around days 10, 20 and 30 of the survey, a CD should be burned that will contain the previous 10 (or so) days worth of data. For example, the CD burned on day 10 would have the data from days 1-10, the CD burned on day 20 would have the data from days 11-20 and the CD burned on day 30 would have the data from days 21-30.
3. It works well to create a separate folder to store all this zipped data. Name this folder ZippedQTCDataFromSurvey (for example, ZippedQTCDataFromStMatts2007).
4. To reduce confusion as to which zipped files are to be (or have been) burned to a CD, it is helpful to create subfolders within the folder created above in step 3 to hold only the zipped files that are to be burned to the CD. Name these folders CDBackupmm.ddtommm.dd. For example, if the zipped QTC data files from August 2nd through August 11th fit onto a blank CD, name the folder CDBackup8.2to8.11.
5. Burn a CD when there is enough zipped data to comfortably fit onto a CD and clearly label it "Zipped QTC Data From Survey" and indicate the dates of the data "Data From mm/dd/yy to mm/dd/yy".

### **Survey laptop external hard drive**

Another thing one could do to help reduce the possibility of losing data is to have the external hard drive plugged into the survey laptop only when you are actually using the external hard drive (when moving files from the D: drive, zipping files or burning a backup CD for example). Keeping it disconnected from the laptop while not in use reduces the possibility of something happening to the external hard drive in the event something goes wrong with the laptop or the vessels electrical system.